DRUGS

THEIR PRODUCTION, PREPARATION & PROPERTIES

H. WIPPELL GADD

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DRUGS

BY THE SAME AUTHOR

A SYNOPSIS
OF THE
BRITISH PHARMACOPŒIA.
A Complete Summary of the
Official Work.

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224 *pages. Bound in Cloth. Price* 1*s. net.*

LONDON: BAILLIÈRE, TINDALL & COX

DRUGS

Their Production, Preparation, and Properties

BY

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ALBERT MEMORIAL COLLEGE, EXETER

LONDON
BAILLIÈRE, TINDALL AND COX
8, HENRIETTA STREET, COVENT GARDEN
1904

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PREFACE.

The object of this work is to give a concise account of the principal vegetable, animal, and chemical substances used in medicine.

It has been written primarily for students, and embraces all the drugs included in the Pharmacopœia or mentioned in the syllabus of the qualifying examination of the Pharmaceutical Society; but it is hoped that it may also be found useful by others who occasionally need information concerning medicinal products.

The drugs have been arranged in classes, like being placed with like; but to facilitate ready reference an exhaustive index has been added. No attempt has been made to describe the drugs adequately, as their distinctive characters can only be learnt from actual specimens, and for students the work is intended to supplement and summarise, not to supplant, personal teaching.

A work of this kind must necessarily be largely a compilation, originality being the least desirable quality in a statement of facts; and, in addition to the British Pharmacopœia, the works of the following authorities have been consulted: Squire, Martindale, White and Humphrey, Lauder Brunton, Whitla, Holmes, Attfield, Maisch, Flückiger and Hanbury, Francis Ransom, C. G. Moor, and the authors of the United States Dispensatory.

The latest researches have been studied in the periodical pharmaceutical press and the Year-Books of Pharmacy. Mr. John R. Jackson, A.L.S. (late of Kew), has very kindly read the proof-sheets of the section relating to vegetable drugs; and Mr. Sydney C. Gadd has read the whole of the proofs, compiled the index, and in other ways given valuable aid.

H. W. G.

EXETER,
12th January, 1904.

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DRUGS

INTRODUCTION.

All drugs are poisons—that is to say, they are inimical to normal healthy life. Their function is to correct irregularities caused by disease, and it follows that with the abatement of the disease the need for the drug ceases.

All medicines possessing sufficient activity to be of much value are poisonous in excessive doses.

The popular theory that if a teaspoonful is good, a wineglassful will be better, is founded on a false analogy with foods. But a food differs essentially from a drug. An excess of the former is usually its own corrective; an excess of the latter may easily be fatal.

One of the greatest evils of the day is the indiscriminate use of drugs by the general public. Little harm was done when only simple herbs were used; but now that powerful chemical substances are common articles of commerce very serious results may follow their indiscriminate use.

Drugs may be roughly divided into three classes:

1. Vegetable products and their preparations.
2 Animal products and their preparations.
3. Substances of definite chemical composition, such

as metallic salts, and the numberless organic compounds isolated or produced by modern chemists.

Organic Compounds.—The term "organic" was formerly applied to substances derived from living organisms, whether vegetable or animal. Since, however, it has been found possible to make artificially a very large number of substances, which it was formerly thought could only be produced by living organisms, the term has altered in meaning.

Organic Chemistry signifies now the *Chemistry of the Carbon Compounds.*

1. VEGETABLE PRODUCTS.—The word "drug" is derived from an Anglo-Saxon root signifying *dry:* not, as the weary student might be tempted to conjecture, from the arid nature of the study; but from the fact that ancient medicines consisted chiefly of dried herbs.

From the earliest times man, in common with the lower creation, has sought relief from the ills to which his flesh is heir in the herbs of the field. Nor has he sought in vain; and to-day many of our most valued remedies are plant products, the virtues of which were discovered empirically in a pre-scientific age.

Roots, stems, barks, leaves, flowers, seeds, and fruits are alike pressed into the service of man; whilst even the waste products of vegetable life—such as gums, resins, and alkaloids—often prove valuable as remedies.

In dealing with plant products, the point of first importance is *identification.* Plants closely allied botanically often differ widely in their therapeutic effects: so that, it is essential that the same species should always be used if uniform results are to be obtained.

The distinctive characters of vegetable products can only be effectually studied by close and constant scrutiny of actual specimens.

Drugs, having been identified, should, if possible, be *assayed;* for the mode of collection, the conditions of cultivation, the influence of climate, and many other factors, tend to produce variations of strength.

When the chief active ingredient of a drug is known and can be readily isolated, an estimation of it gives approximately the value of the drug. Thus, opium is valued by the amount of the alkaloid *morphine* which it contains; nux vomica by its yield of *strychnine;* jalap root by its percentage of *resin;* and other drugs in like manner.

When the active ingredients of a drug are unknown or cannot readily be assayed, its value can sometimes be approximately found by treating it with solvents, by incinerating and noting the yield of ash, and by applying other simple tests.

For example, *benzoin* is valued by its solubility in spirit, as commercial samples often contain a large percentage of insoluble matter, chiefly bark, which is harmless, but inert.

Again, in the case of the now rarely used drug *asafetida*, the percentage of ash left after incineration is a fair criterion of quality. The pure natural product is completely combustible, but the stony matter with which commercial samples are often mixed resists a red heat. The amount of residue after burning is, therefore, an approximate measure of the adulteration of the drug, and indirectly of its value.

Pharmacy (from the Greek word φάρμακον, *pharmăkon*, "a drug") is the art of preparing and compounding medicines, and embraces all the methods by which crude drugs are brought into the condition in which they may be administered with the greatest effect upon, and the least discomfort to, the patient.

Vegetable drugs are sometimes used in the fresh or green state, but more often they are dried as the first step towards bringing them into a fit condition for use. Having been dried, they are either reduced to powder or disintegrated sufficiently to be readily acted upon by solvents.

By the action of solvents the various pharmaceutical preparations, which are known as *Galenicals* (from the Greek physician Galen, who is reputed to have introduced or fostered their use), are prepared from the crude drugs.

The most generally useful solvent is water, and many drugs are exhausted by its use alone. Where water fails to extract the virtues of a drug, alcohol in one of its varied forms is often used. Other solvents used are ether, chloroform, glycerin, acids, and alkalies.

In this work the various pharmaceutical preparations will be described under the crude drugs from which they are prepared. It may be convenient, however, to briefly state here the general principles by which the different classes of Galenicals are prepared, taking first those in which water is used as the solvent. By water, in pharmacy, unless otherwise indicated, distilled water is meant.

Distillation is essentially the evaporation and subsequent condensation of a liquid.

In distilling water, the volatile impurities come over in the first portion of the distillate, which is therefore rejected; whilst the grosser impurities, such as dissolved salts, are left in the last fraction, which is also rejected, the middle portion alone being used.

Medicated Waters are weak aqueous solutions of the active principles of drugs. They are sometimes prepared by simple solution, as in the case of chloroform water; but more often by distilling water in which the drug is immersed, by which means the volatile principles are carried over with the aqueous vapour, and the condensed product is impregnated with them.

For example, in making cherry-laurel water the leaves are broken, immersed in water, and the mixture heated in a still. The resulting distillate is a weak solution of prussic acid, which is the active principle of the leaves.

Infusions are prepared by steeping drugs in water, usually hot, for a definite short period of time. The beverages tea and coffee are the best popular examples of this process.

Decoctions (from the Latin *de* and *coquo*, I boil down) are prepared by boiling drugs in water for a definite short period of time.

Solid Aqueous Extracts are prepared by exhausting drugs with water and evaporating the resulting solution to dryness.

Liquid Aqueous Extracts are made by exhausting drugs with water, but to the resulting solution some alcohol is added in order to preserve it. The strength of liquid extracts is usually adjusted so that one fluid part of the extract shall contain the soluble portion of one part by weight of the drug.

Of the preparations, in which alcohol is used as the solvent, the most important are those known as *Tinctures.* Strictly speaking, a tincture (from the Latin *tingo, tinctum*, I dye) is simply a coloured solution, but the word is usually applied to a spirituous solution of the active principles of a drug.

Tinctures are usually made by either maceration or by percolation. In the process known as *maceration* the comminuted drug is steeped in the solvent for a definite long period of time, the whole being agitated occasionally. This process formerly lasted a month, and hence the solvent was called the *menstruum* (from the Latin *mensis*, a month).

Percolation.—In order to conduct this process, the crushed or powdered drug is soaked in the solvent, and then packed tightly in a conical vessel fitted with a strainer at the bottom, known as a percolator; more of the solvent is then poured over the drug and allowed to slowly pass through. When the drug is exhausted, the "marc," as the mass is called, is removed from the percolator and submitted to pressure, to collect all the liquid that it contains.

The word "percolation" is derived from the Latin *per*, through, and *colo*, I strain, but the process is essentially different from straining or filtration. In both a liquid is passed through a porous mass; but in the one (filtration) the liquid loses some of its dissolved or suspended matter in its passage, whilst in the other (percolation) the product is made richer by the process. In a word, filtration is subtraction; percolation is addition.

Alcoholic Liquid Extracts are prepared similarly to the aqueous preparations of the same class.

Solid Alcoholic Extracts are prepared by exhausting a drug with spirit and evaporating the resulting product to a solid or semi-solid condition.

Medicated Wines are prepared by dissolving the active principles of drugs in wines, such as sherry or orange, which are essentially weak alcoholic solutions.

Other classes of Galenicals are the *Vinegars*, which are prepared by the use of vinegar or weak acetic acid; *Green Extracts*, which are prepared from fresh vegetable juices; and the *Juices*, which are the fresh juices of plants, preserved by the addition of some alcohol.

2. ANIMAL PRODUCTS.—The animal products used in medicine are not numerous, although of late years a new

class of remedies, consisting of animal glands and tissues and their preparations, has been introduced. The only preparations of this class, however, at present officially recognised in the Pharmacopœia are those of the thyroid gland of the sheep and the fresh pancreas of the pig.

The antitoxins and sera, which are now such valuable adjuncts to the physician's armoury, hardly come within the scope of this work.

3. Chemical Substances.—The chemical substances used in medicine are very numerous, and are likely to become more so as science advances. Metallic salts have been used for centuries; and more recently the active principles of vegetable products have been isolated, and in some cases artificially made.

Numberless synthetic (from Greek σύν, *syn*, together, and τίθημι, *tithēmi*, I put) organic compounds have been built up by modern chemists, and many of these have proved valuable remedies in disease.

SECTION I.

VEGETABLE PRODUCTS.

CHAPTER I.

Roots and Root Barks.

OFFICIAL ROOTS.

THE first root mentioned in the British Pharmacopœia is also of prime importance :

Aconite.—The root of *Aconitum Napellus* (Nat. Ord., Ranunculaceæ), the plant which is better known, from the shape of its beautiful flower, as Monkshood.

Plants have two names, generic and specific. The specific name is the name of the individual. The generic name that of the genus or group. In this instance *Aconitum* is the generic name, and is derived from the Greek word ἄκων, *akōn*, which signifies a dart, the genus being probably so named because from it arrow poisons were prepared. *Napellus*, the specific name, is derived from a Latin word meaning a turnip, and refers to the shape of the root.

A Natural Order is an arbitrary division into which plants which have certain definite characteristics are grouped. The typical plant of the Nat. Ord. Ranunculaceæ is the common buttercup.

The following are the characteristics of Aconite Root: Length, about 3 inches; breadth, about $\frac{2}{3}$ inch at the upper end, tapering downwards. Colour, dark-brown externally, whitish internally. Marked with scars. Fracture short. The most marked characteristic is the taste, which produces a persistent sensation of tingling numbness in the mouth. This is due to the very powerful alkaloid,* *Aconitine*, which is present in the root.

There being no ready means of assaying the strength of the root, stringent regulations are laid down for its cultivation and collection in order to obtain some measure of uniformity in the drug and its preparations. It must be grown in Britain and collected in the autumn, as the root is then richest in alkaloid. It must not be hollow or spongy, nor should it retain any portion of the stem, as such conditions would show that the root had been collected at the wrong season.

Aconite is valuable as an anodyne or pain reliever (from Greek *ἀ*, *a*, or *ἄν*, an, a prefix signifying negation, and *ὀδύνη*, *odynē*, meaning pain) and antipyretic (from Greek *ἀντί*, *anti*, against, and *πυρετός*, *pyretos*, fever). Used externally, it relieves pain, such as neuralgia; given internally, it relieves pain and reduces temperature.

The official preparations from aconite root are:

1. The alkaloid *Aconitine*. Various products have been sold under the name of Aconitine, their potency differing as much as their composition, as is evidenced by the fact that $2\frac{1}{2}$ grains have been taken with impunity, and $\frac{1}{128}$ grain has proved fatal. Only the pure crystalline alkaloid is now officially recognised. This is a highly toxic substance, and no dose is given for it in the Pharmacopœia. It is soluble in rectified spirit and chloroform, but almost insoluble in water. It is used

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* Alkaloids are nitrogenous plant waste products, chemically analogous to ammonia.

for preparing *Aconitine Ointment*, which is made by dissolving 1 part of the alkaloid in 8 parts of oleic acid, and mixing the product with 41 parts of lard. The strength of this ointment is therefore 1 in 50, or 2 per cent.

2. *Liniment of Aconite* is a very strong preparation for external use only. It is made by exhausting powdered aconite root by macerating and percolating it with rectified spirit. A little camphor is dissolved in the percolate, and the finished preparation contains the soluble portion of 1 part of the root (with 0·03 parts of camphor) in 1½ fluid parts of the liniment.

3. *Tincture of Aconite* is made by percolating the powdered drug with alcohol (70 per cent.). The strength of the finished product is 1 in 20, and the dose 5 to 15 minims, or, if very frequently repeated, 2 to 5 minims.

Horseradish Root is better known and more used as a condiment than a drug, but it has stimulant properties, and is used in the preparation of the *Compound Spirit of Horseradish*. Aconite root has been mistaken for horseradish with dire results ; but the latter is easily recognised by its cylindrical shape and yellowish-white colour, and particularly by its very pungent taste and pungent odour when scraped or bruised. The smell and taste are due to the volatile oil, of which the root contains 0·05 per cent., and which is identical with oil of black mustard.

(There are two classes of oils, fixed and volatile, the former being obtained by expression and the latter by distillation.)

The botanical name of the horseradish is *Cochlearia armoracia*, and the plant, which is a native of Eastern Europe, belongs to the Nat. Ord. Cruciferæ. *Compound Spirit of Horseradish* is prepared by distilling a mixture of the scraped root, with bruised orange-peel and nutmeg, rectified spirit and water. The dose is 1 to 2 fluid drachms.

Belladonna Root.—Belladonna is the poetical pseudonym under which the deadly nightshade masks its identity. The botanical name of the plant is *Atropa Belladonna,* the name of the genus being derived from the Greek Ἄτροπος, *Atrŏpos*, the Fate, who, in mythologic fable, cut the thread of life; whilst the word "belladonna," signifying "beautiful lady," is said to be derived from the fact that the Italian women used a water distilled from the plant as a cosmetic. It belongs to the Nat. Ord. Solanaceæ, which includes many plants having poisonous properties. The root is pale greyish-brown in colour, and is wrinkled longitudinally. The transverse fracture is short, and internally the root is whitish with a dark ring between the wood and the bark. It is obtained from plants cultivated in England and Germany.

Medicinally, belladonna is anodyne, mydriatic (dilates the pupil of the eye), and a local anæsthetic (Greek, ἀ, *a*, or ἀν, an, negative prefix; αἴσθησις, *aisthēsis*, sensation), these properties being due to the alkaloids which the root contains to the extent of about 0·4 per cent., and which consist of hyoscyamine and its isomer atropine.

(Isomers—Greek, ἴσος, *isos*, like; μηρός, *mēros*, part—are substances having identical molecular composition, but different properties.)

The official preparations of belladonna root are:

The alkaloid *Atropine*, the maximum dose of which is $\frac{1}{100}$ grain. It is used for preparing *Atropine Ointment*, as it is soluble in fats, etc.

Sulphate of Atropine, which, being readily soluble in water, is used for making—

The 1 *per cent. Solution*, and the *Lamellæ* or *Discs*. The latter are tiny gelatin discs weighing about $\frac{1}{50}$ grain and containing $\frac{1}{5000}$ grain of the sulphate.

The *Liquid Extract*, which is prepared by exhausting the root by percolation and repercolation with a mixture of 7 volumes of alcohol (90 per cent.) and 1 volume of water. The resulting product is standardised to contain 0·75 per cent. alkaloids.

(Alkaloids occur in plants in combination with vegetable acids. To estimate the quantity present in a vegetable product an aqueous or weak alcoholic solution is prepared. By the addition of an alkali to this solution, the alkaloid is liberated, and can be taken up by a suitable solvent. A solvent is chosen in which the alkaloid is more soluble than it is in water, and which is immiscible with that liquid, so that after agitation complete separation can be effected.)

The process for estimating the alkaloids in the liquid extract of belladonna can be briefly summarised thus: The liquid extract is diluted with water and agitated with solution of ammonia (to free the alkaloids) and chloroform (to dissolve the alkaloids). The chloroformic solution is then separated; and the crude alkaloids, which it contains, are partially purified by agitation with a dilute solution of sulphuric acid. The resulting solution of alkaloidal sulphates is rendered alkaline with ammonia, and the purified alkaloids removed by shaking with chloroform. The chloroform is separated and evaporated to dryness, the residue consisting of nearly pure alkaloids. To find the actual percentage of pure alkaloid in the residue, it is first dissolved in a very dilute solution of hydrochloric acid of known strength. The excess of acid is then determined by the addition of a solution of caustic soda or potash of known strength. The loss of free acid equals the amount which has entered into combination with the alkaloids, and is indirectly the measure of their quantity.

This process is troublesome and difficult to work, as the fatty and resinous bodies present in the root cause emulsions to form. It has been suggested, therefore, that these should be removed by a preliminary treatment with chloroform in acid solution.

From the liquid extract are made :

1. The *Alcoholic Solid Extract*, which is prepared by evaporating the liquid extract, and adjusting the strength of the product by the addition of milk-sugar so that the finished extract may contain 1 per cent. of alkaloids. The maximum dose of this extract is 1 grain, and from it are made the official *Belladonna Suppositories*, each of which contains approximately $\frac{1}{60}$ grain of alkaloids.

2. *Belladonna Plaster*, which is made by evaporating 4 fluid parts of the liquid extract to 1 part by weight, and mixing this with 5 parts resin plaster. The finished plaster contains 0·5 per cent. of alkaloids.

3. *Liniment of Belladonna*, which is practically the liquid extract diluted to twice its bulk with water and rectified spirit, with the addition of a little camphor. Its strength is therefore 0·375 per cent. alkaloids.

4. *Tincture of Belladonna*, which is made from the liquid extract, and is standardised to contain 0·05 per cent. alkaloids. Its dose, in common with all potent tinctures, with the single exception of tincture of iodine, is 5 to 15 minims.

5. *Ointment of Belladonna.* Made from the liquid extract. Contains 0·6 per cent. alkaloids.

Homatropine Hydrobromide is the hydrobromide of an alkaloid prepared from tropine, which is a derivative of atropine. Homatropine hydrobromide has similar properties to atropine, but is weaker. Dose, $\frac{1}{80}$ to $\frac{1}{20}$ grain.

The preparation is *Homatropine Discs*. Each disc contains $\frac{1}{100}$ grain of hydrobromide of homatropine.

Liquorice Root.—The dried peeled root and underground stem of *Glycyrrhiza glabra* (Nat. Ord., Leguminosæ). The generic name is from the Greek *γλυκύς*, *glykys*, sweet, and *ρἵζα*, *rhiza*, a root, and is self-explanatory; whilst the specific name, which signifies in Latin, smooth, refers to the character of the surface of the leaves. Liquorice root acts as a demulcent and expectorant, but is chiefly used as a pleasant vehicle for the administration of more potent drugs.

The official preparations are:

1. The *Solid Extract*, which is prepared by exhausting the drug with water.

2. The *Liquid Extract*, which is prepared similarly, but preserved by the addition of rectified spirit.

3. The *Compound Powder of Liquorice*, a preparation which depends for its activity more upon the senna, which it contains; than on the drug, which gives it its name. It consists of 2 parts of powdered senna, 2 parts of powdered liquorice root, 1 part of powdered fennel, 1 part of sublimed sulphur, and 6 parts of powdered sugar; and is very largely used as a mild laxative.

Jalap is the dried root of *Ipomœa purga* (Nat. Ord., Convolvulaceæ), a native of Central America, the specific name indicating its medicinal action. The active principle of jalap is a resin, which has been found in quantities varying from 8 to 20 per cent. It is officially enjoined, however, that the drug should yield about 10 per cent.; but obviously only the powdered root can be thus standardised.

The preparations are:

1. The *Resin*, which is prepared by percolating the powdered root with alcohol (90 per cent.) evaporating the alcohol from the resulting tincture, and washing the residue with hot water. The maximum dose of the resin is 5 grains. It should yield little or nothing to warm water, and not more than 10 per cent. to ether,

these tests indicating the absence of scammony resin and resin of Tampico jalap.

2. *Compound Powder of Jalap*, which contains one-third of its weight of the powdered root, with powdered ginger and acid tartrate of potassium. Dose, 10 to 60 grains.

3. *Extract of Jalap*, which is prepared by exhausting the powdered root with alcohol (90 per cent.) and water. Dose, 2 to 8 grains. Strength, about twice that of the root.

4. *Tincture of Jalap*, which is prepared by percolating the powdered root with alcohol (70 per cent.), and is standardised to contain 1·5 per cent. resin. Dose, ½ to 1 fluid drachm.

Ipecacuanha.—The name is said to be derived from a native Brazilian word, signifying "the smaller roadside sick-making plant," the drug being the root of a small shrub, called *Psychotria Ipecacuanha* (Nat. Ord., Rubiaceæ), which grows in Brazil. *Psychotria*, from the Greek ψυχή, *psychē*, life, would seem to have reference to the medicinal value of the drug, which has been used for many centuries, and is still much esteemed as a diaphoretic and expectorant, and in large doses emetic. (Diaphoretic, promotes perspiration from Greek διά, *dia*, through ; φορέω, *phoreō*, I carry). It contains about 2 per cent. of alkaloids, about three-quarters of which is *emetine ;* the remainder being *cephaeline*, with a small quantity of a third alkaloid, which has been named *psychotrine.*

The official root is known in commerce as Rio Ipecacuanha. The chief other commercial varieties are known as Carthagena Ipecacuanha and Johore Ipecacuanha. Rio Ipecacuanha is somewhat contorted, and closely annulated or ringed, and occurs in pieces about 6 inches long by ¼ inch thick. The Carthagena root, which contains the same alkaloids, but in different relative proportions, and which has not therefore the same medicinal properties, occurs in larger pieces and is not so annulated.

The dose of the powdered root as an expectorant is $\frac{1}{4}$ to 2 grains, and as an emetic 15 to 30 grains, and from it are made :

1. The *Compound Powder*, which is known, from the name of its first prescriber, as *Dover's Powder*. It contains 10 per cent. of powdered ipecacuanha, with 10 per cent. of powdered opium and 80 per cent. of sulphate of potassium.

2. *Ipecacuanha Lozenges*, each of which contains $\frac{1}{4}$ grain of the powdered drug.

3. *Morphine and Ipecacuanha Lozenges*, each of which contains $\frac{1}{12}$ grain of powdered ipecacuanha, with $\frac{1}{36}$ grain of morphine hydrochloride.

4. The *Compound Pill of Ipecacuanha and Squill*, which is made from Dover's powder, with the addition of powdered squill and powdered ammoniacum ; the whole being massed with syrup of glucose; and the resulting product containing about 5 per cent. of ipecacuanha and 5 per cent. of opium.

The Galenical preparations of ipecacuanha are made from the liquid extract.

1. The *Liquid Extract*—strength, 2 to $2\frac{1}{2}$ per cent. alkaloids. Prepared by making a strong alcoholic liquid extract, estimating the amount of the alkaloids in the strong extract, and diluting with alcohol (90 per cent.) to produce a liquid extract containing not less than 2 or more than $2\frac{1}{4}$ per cent. alkaloids. The process of estimation is conducted as follows : The alcohol is first removed by evaporation, and the ipecacuanhic acid, together with the fat, resin, etc., precipitated by the addition of solution of lead subacetate ; the excess of lead removed by adding dilute sulphuric acid, which

forms insoluble sulphate of lead; and the alkaloid extracted from the filtrate by the addition of solution of ammonia and chloroform in a similar manner to that already described under Belladonna (see p. 12). Dose, as an expectorant, ½ to 2 minims; as an emetic, 15 to 20 minims.

2. The *Vinegar* contains 1 of liquid extract, together with 2 of alcohol (90 per cent.) and 17 of diluted acetic acid. Dose, 10 to 30 minims.

3. The *Wine* is of the same strength as the vinegar, and is prepared by mixing 1 of liquid extract with 19 of sherry. Dose, as an expectorant, 10 to 30 minims; as an emetic, 4 to 6 fluid drachms.

The next root that we have to consider is of a very different character:

Calumba, the root of the *Jateorhiza Columba*, although its generic name (from *ἰατήρ*, *jatēr*, physician, and *ῥίζα*, *rhiza*, root) seems to signify that it is of considerable medicinal value, is only used as a bitter stomachic and mild tonic. The plant is indigenous to Portuguese East Africa (its native name being Kalumb), and belongs to the Nat. Ord. Menispermaceæ. The roots come into commerce in slices, which have a very characteristic appearance, and may be known by their yellow colour, depressed centres, thick bark, and short fracture. The activity of the root is due to the bitter principles which it contains—viz., *Berberine*,* a yellow crystalline alkaloid; *Calumbic Acid;* and its anhydride, *Calumbin*.

(An anhydride—Greek *ἀ*, *ἀν*, a, an, (negative prefix), and *ὕδωρ*, *hydōr*, water—is an acid from which the elements of water have been removed—*e.g.*, carbonic anhydride, sulphurous anhydride, etc.)

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* It has been recently stated that the root probably does not contain berberine, but at least two other alkaloids which resemble it.

It also contains much starch, to avoid dissolving which the infusion is made with cold water; but no tannin, which renders it suitable for prescribing with salts of iron.

The official preparations are:

1. The *Infusion*, which is made by infusing 1 part of the drug with 20 fluid parts of cold water for half an hour. Dose, ½ to 1 fluid ounce.

2. The *Concentrated Solution*, which is ten times the strength of the infusion, and is preserved by the addition of rectified spirit. Dose, ½ to 1 fluid drachm.

3. The *Tincture*, which is made by macerating 1 part of the drug in 10 fluid parts of alcohol (60 per cent.). Dose, ½ to 1 fluid drachm.

Hemidesmus.—The dried root of *Hemidesmus indicus* (Nat. Ord., Asclepiadeæ). This drug, which is of a reddish-brown or dark-brown colour, has a pleasant odour and somewhat sweet taste. As its specific name implies, it comes from India; and as it has been said to have similar medicinal properties to those of sarsaparilla, it has been called Indian sarsaparilla. It is chiefly used, however, as a flavouring agent, the only official preparation being the syrup, the strength of which is about 1 in 10, and the dose, ½ to 1 fluid drachm.

Rhatany or Krameria Root.—Two botanical sources are officially recognised for this drug: (1) *Krameria argentea*, Para rhatany, the specific name of which (from the Latin *argentum*, silver) refers to the silvery appearance of the leaves. This variety is obtained from Brazil. (2) *Krameria triandra*, Peruvian rhatany, the specific name of which (from the Greek τρεῖς, *treis*, three, and ἀνήρ, *anēr*, a male) refers to the fact that the flower has three stamens (male organs). This variety is found on the mountains of Peru and Bolivia. Both species belong to the Nat. Ord. Polygaleæ. Para rhatany bark is of a purple-brown colour and has transverse cracks. Peruvian rhatany bark is reddish-brown. Rhatany bark contains about 20 per cent. of tannic acid and is strongly astringent.

The official preparations are:

1. The *Extract*, which is made by exhausting the drug by percolation with water. Dose, 5 to 15 grains.

2. The *Infusion*, which is made by infusing the drug with boiling water. Strength, 1 in 20. Dose $\frac{1}{2}$ to 1 fluid ounce.

3. The *Concentrated Solution*, which is ten times the strength of the infusion. Strength, 1 in 2. Dose, $\frac{1}{2}$ to 1 fluid drachm.

4. The *Tincture*, which is prepared by percolation with alcohol (60 per cent.). Strength, 1 in 5. Dose, $\frac{1}{2}$ to 1 fluid drachm.

5. The *Lozenges*, which are prepared from the extract, and contain 1 grain of extract of krameria in each.

6. The *Compound Lozenges*, which contain $\frac{1}{20}$ grain of cocaine hydrochloride and 1 grain of extract of krameria in each.

Pareira Root.—The dried root of *Chondrodendron tomentosum* (Nat. Ord., Menispermaceæ). The genuine drug may be distinguished from the false, of which large quantities are found on the market, by the waxy surface and concentric rings of its transverse section. The false Pareira shows no waxy surface when cut, and is also distinguished by its eccentric and incomplete rings.

The medicinal properties of Pareira Root are tonic and diuretic (a diuretic is a drug which increases the flow of urine), the only official preparation being the *Liquid Extract*, which is made and standardised as follows: (*a*) The powdered root is exhausted by percolation with boiling water. (*b*) The amount of extractive in the resulting product is estimated by evaporating a small portion. (*c*) The bulk of the percolate is concentrated until it contains 33⅓ per cent. of extractive. (*d*) Every 3 parts are made up to 4 parts by the addition of alcohol (90 per cent.). Dose, ½ to 2 fluid drachms.

This process of standardisation is a fairly good one, but is open to two objections: Firstly, the drug is not of great importance or potency, and is therefore hardly worth standardising, especially as, secondly, the standardised liquid extract quickly throws down a deposit, and commercial samples sometimes yield only half the theoretical amount of extractive, although they may have conformed to the official standard when first prepared.

Pellitory.—This drug is the dried root of *Anacyclus pyrethrum* (Nat. Ord., Compositæ). It is a native of North Africa. The specific name, from the Greek πῦρ, *pyr*, fire, probably refers to the pungent taste of the drug. Pellitory, when chewed, induces a copious flow of saliva.

The only official preparation is the *Tincture*, which is prepared by exhausting the powdered root by percolation with alcohol (90 per cent.). It is used for the relief of toothache. One part of root makes 5 fluid parts of tincture.

Sarsaparilla is the dried root of *Smilax ornata* (so-called because its leaves are beautifully variegated. Nat. Ord., Liliaceæ). The root is very long, tough, and flexible, and has numerous rootlets. It is usually imported bound in bundles. It is collected in Central America, but as it was formerly imported by way of Jamaica, it is known as Jamaica sarsaparilla.

The medicinal properties of sarsaparilla are said to be alterative and tonic, but some doubt has been thrown upon its efficacy.

(Alteratives are medicines which alter the morbid processes and cure disease without any marked effect upon the organs.)

The official preparations are:

1. The *Liquid Extract*, which is prepared by percolation with alcohol (20 per cent.), 10 per cent. of glycerin being added as a preservative. Strength, 1 in 1. Dose, 2 to 4 fluid drachms.

2. The *Concentrated Compound Solution*, which is the official representative of the old compound decoction, but is eight times its strength.

In addition to sarsaparilla; sassafras root, guaiacum wood, liquorice root, and mezereon bark are used in its manufacture. Dose, 2 to 8 fluid drachms.

Scammony Root.—The dried root of *Convolvulus Scammonia* (Nat. Ord., Convolvulaceæ), a native of Western Asia. Scammony root occurs in commerce in large pieces, usually twisted, and from about 1 to 3 inches in diameter. A good root contains about 5 per cent. of resin. The drug known as *Scammony*, or *Virgin Scammony*, is a gum-resin obtained by incision of the living root of the *Convolvulus Scammonia.*

(A gum-resin is a vegetable waste-product containing variable quantities of gum and resin and sometimes some volatile oil.)

Virgin Scammony contains a variable quantity of resin (the Pharmacopœia requiring at least 70 per cent.), answering the tests for scammony resin. It is used as a cathartic (from Greek καθαρτικός, *kathartikos*, fit for cleaning, purgative) and vermifuge, the official dose being 5 to 10 grains.

A drug of more definite composition is the *Resin*, which is prepared by exhausting the dried root by percolation with alcohol (90 per cent.). *Scammony Resin* is almost entirely soluble in ether, and gives no blue colour with test solution of ferric chloride. These tests distinguish it from the resins of jalap and guaiacum. Its medicinal properties are similar to those of virgin scammony, but, being stronger, the dose is only 3 to 8 grains. It enters into the composition of compound scammony pill, compound scammony powder, compound extract of colocynth, compound colocynth pill, compound colocynth and henbane pill.

Senega.—The dried root of *Polygala Senega* (Nat. Ord., Polygaleæ), a native of the United States of North America. The specific name is that of the Seneca tribe of Indians, who used the drug as a remedy for snake bites, for which reason it is also called rattlesnake root. Senega roots are from 2 to 4 inches long, enlarged at the top into a knotty crown, bearing the bases of numerous stems. The drug contains two glucosides, *Senegin* and *Polygalic Acid.*

(Glucosides are plant products, allied to glucose.)

The medicinal properties of senega are expectorant, diaphoretic, and diuretic, the official preparations being the *Infusion*, the *Concentrated Solution* (10 times the strength of the infusion), and the *Tincture.*

The drug **Sumbul** consists of the dried transverse slices of the root of *Ferula Sumbul* (Nat. Ord., Umbelliferæ), a native of Central and North-East Asia. The drug is a nerve stimulant, and is given in the form of a *Tincture*, the strength of which is 1 in 10. Dose, ½ to 1 fluid drachm.

Sassafras.—The dried root of *Sassafras officinale* (Nat. Ord., Laurineæ), a native of North America. (*Officinale*—from Latin *officina*, a workshop — signifies a drug in common use, and must be distinguished from *official*, which indicates a drug the use of which is sanctioned by authority.)

Sassafras contains about 5 per cent. of a volatile oil. It has somewhat similar properties to those of sarsaparilla, and is used in conjunction with that drug. It occurs in commerce in large branched pieces, more or less covered with a rough greyish-brown or rusty-brown bark.

Taraxacum Root.—The root of the common dandelion, *Taraxacum officinale* (Nat. Ord., Compositæ), is used for medicinal purposes in both the fresh and dried states.

From the *fresh root* are prepared the *Solid Extract*, which is essentially the expressed juice evaporated to a soft extract, and the *Official Juice* (*succus*), which consists of 3 parts of expressed juice with 1 part of rectified spirit added to preserve it.

From the *dried root* is prepared the *Liquid Extract*, by exhaustion with alcohol (60 per cent.). Strength, 1 in 1. Dose, ½ to 2 fluid drachms.

The generic name of the dandelion, from the Greek word ταράσσω, *tarassō*, I stir, or disturb, graphically describes its action on the human system. The common English name, from the Latin *dens leonis*, through the French *dent de lion*, describes the supposed resemblance of the leaf margin to a lion's tooth. The dandelion is found as a troublesome weed in all parts of Europe.

The medicinal properties of the root, which should be collected in the autumn, are those of a mild laxative and bitter tonic. It is used as a hepatic (from Greek ἡπατικός, *hēpatikos*, of, or belonging to, the liver), but is said to be only a feeble stimulant of the liver.

Unofficial Roots.

Marshmallow Root, the botanical source of which is *Althæa officinalis* (Nat. Ord., Malvaceæ), is sometimes used in the form of an infusion or syrup as a demulcent. It may be recognised by its woolly appearance and short granular fracture. The English name refers to its growing chiefly in damp places, whilst its generic name is derived from the Greek ἄλθειν, *althein*, I heal.

Elecampane is the root of the *Inula Helenium*, a plant which is a native of Central and Southern Europe, and belongs to the Nat. Ord. Compositæ. The drug, as found in commerce, consists of transverse slices of the root. It has a peculiar camphoraceous taste, and yields an aromatic oil. The active principle, *Helenin*, is a powerful antiseptic, and is given in doses of ½ to 2 grains.

Alkanet, the root of the *Alkanna tinctoria* (Nat. Ord., Boragineæ), is used as a colouring agent. It is grown in Hungary, the Grecian Archipelago, and Asia Minor. It occurs in pieces from 4 to 6 inches in length and of a deep purple colour.

Bryony Root may be recognised, when fresh, by its nauseous odour, and, when dry, by its intensely bitter taste ; its tapering appearance ; and its transverse, corky ridges. The botanical name of the plant is *Bryonia dioica* (from Greek βρύω, *bryō*, I shoot, or burst forth ; and δίς, *dis*, double, and οἶκος, *oikos*, a house, referring to the fact that the male and female flowers are found on different plants). Bryony belongs to the Nat. Ord. Cucurbitaceæ. Both the fresh and dried roots have been used in medicine, the drug acting as a powerful hydragogue cathartic causing liquid motions.

The British Pharmaceutical Conference Formulary contains a *Tincture of Bryony*, made from the fresh root, the strength of the finished product being, however, adjusted to 1 in 10 of the dried root. The dose is 1 to 10 minims.

Root-Barks.

Euonymus Bark is the dried bark of the root of *Euonymus atropurpureus* (Nat. Ord., Celastreæ). This plant, which is called by the Indians "wahoo," is a native of the United States. The root-bark alone is official, and preparations made from it have been proved to be stronger than those made from the bark of the stem. In colour it is a light ash-grey, whereas the bark of the stem is dark greenish-grey.

The drug contains a bitter principle, *Euonymin ;* but, unfortunately, this name has been applied to some indefinite preparations, which are really extracts to which a desiccating agent has been added to bring them into a dry powdered form. These are known as green and brown euonymin, the former being coloured with chlorophyll.

Medicinally, euonymus bark is a cholagogue (from Greek, χωλή, *chōlē*, bile ; and ἀγωγός, *agōgos*, leading, a medicine which carries off bile) and cathartic, and the official preparation is :

The *Dried Extract*, which is prepared by exhausting the drug by percolating with alcohol (45 per cent.), evaporating the product to dryness, and mixing it with 25 per cent. of its weight of calcium phosphate. Dose, 1 to 2 grains.

Pomegranate Bark.—The dried bark of the stem and root of *Punica granatum*. The specific name probably refers to the numerous seeds (Latin, *grana*) found in the fruit. It belongs to the Nat. Ord. Lythrarieæ. It is indigenous to North-Western India, but has long been cultivated, and is now found in most subtropical countries. The drug has astringent and anthelmintic (Greek ἀντι, against, ἕλμινς, a worm) properties, and has been used for many centuries for the expulsion of tapeworm. The astringency is due to the presence of tannic acid, chiefly punico-tannic acid.

(Barberry root-bark and the bark of the box, which are sometimes mixed with pomegranate bark, contain no tannin, and are therefore not affected by salts of iron.)

Pomegranate bark contains four alkaloids, known respectively as:

[*] *Pelletierine* or *Punicine*	Liquid.
Isopelletierine	
Methylpelletierine	Crystalline.
and	
Pseudopelletierine	

The anthelmintic properties of the bark are due to the first two, which constitute about half the total alkaloidal content of the drug. This varies from about 0·5 per cent. in the bark of commerce to 2 per cent. or more in the Indian root-bark.

The official preparation is the *Decoction*—strength, 1 in 5; dose, ½ to 2 fluid ounces.

UNOFFICIAL ROOT-BARK.

Barberry Bark.—The dried root-bark of *Berberis vulgaris* (Nat. Ord., Berberidaceæ). The common barberry grows wild in this country. It has a bitter but not astringent taste. It is the principal source of the alkaloid *Berberine*, which is also found in calumba root and hydrastis rhizome.

The drug acts as a tonic and febrifuge in small doses, and as a cathartic in large.

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[*] So-called in honour of the French chemist Pelletier.

CHAPTER II.

Underground Stems: Rhizomes, Bulb and Corm.

RHIZOMES.

ALTHOUGH the word is derived from the Greek, *ῥίζα*, *rhiza*, a root, it signifies botanically a creeping underground stem.

Arnica.—This drug consists of the dried rhizome and roots of the *Arnica montana*, or leopard's bane (Nat. Ord., Compositæ). It is collected in the autumn in the mountainous parts of Central and Southern Europe. It contains 0·5 per cent. of a volatile oil, also a bitter principle, *arnicin*.

Its medicinal properties are stimulant and diaphoretic, but the tincture (1 in 20), which is the only official preparation, is chiefly used diluted with water as an external application for bruises and sprains.

Gentian.—The dried rhizome and roots of *Gentiana lutea*, the yellow gentian (Nat. Ord., Gentianeæ), a plant which is indigenous to Central Europe. The drug is yellowish-brown in colour, wrinkled longitudinally, and is usually tough and flexible. Its taste is sweet at first, owing to the presence of a sugar, but it has a bitter after-taste, which is due to *gentio-picrin*. *Gentio-picrin* is a colourless crystalline substance soluble in rectified spirit.

The properties of gentian are those of a bitter tonic.

The official preparations are:

1. The *Compound Infusion* (1 in 80), in which the gentian is combined with orange and lemon peel. Dose, ½ to 1 fluid ounce.

2. The *Compound Tincture* (1 in 10), which contains also orange-peel and cardamom seeds. Dose, ½ to 1 fluid drachm.

3. The *Extract*, which is largely used as an excipient for pills. Dose, 2 to 8 grains.

Hydrastis.—The dried rhizome of *Hydrastis Canadensis* (Nat. Ord., Ranunculaceæ), the golden seal. It is imported into this country in small pieces, having on the upper surface cup-shaped scars and on the lower surface and sides numerous thin, brittle roots. As its botanical name (Greek, *ὕδωρ*, *hydōr*, water) implies, hydrastis grows in moist places in Canada. It contains the alkaloids: berberine (about 4 per cent.), hydrastine (about 2 per cent.), and canadine.

Its medicinal properties are those of a tonic and nerve stimulant; it is also astringent and hæmostatic (Greek, *αἷμα*, blood; *ἵστημι*, I stop or check).

The official preparations are:

1. The *Liquid Extract*—strength, 1 in 1; dose, 5 to 15 minims.

2. The *Tincture*—strength, 1 in 10; dose, ½ to 1 fluid drachm.

Podophyllum.—The dried rhizome and roots of *Podophyllum peltatum* (Nat. Ord., Ranunculaceæ), the May Apple; it is indigenous to the Eastern United States of America and Canada. The rhizome occurs in straight cylindrical pieces having root scars.

Podophyllum emodi is much stouter and more knotty.

Podophyllum peltatum contains 4 to 5 per cent. of a resin, also starch and sugar.

Medicinally, it is a cholagogue and cathartic.

The preparations are :

1. The *Resin ;* dose, $\frac{1}{4}$ to 1 grain.

2. The *Tincture*, prepared by macerating the resin in alcohol, 90 per cent. ; strength 1 (of resin) in 30 ; dose, 5 to 15 minims.

Podophyllum resin is prepared by exhausting the drug with rectified spirit and precipitating the resin from the resulting solution (after the removal of the greater part of the alcohol), by pouring it into acidulated water. The resin is an amorphous powder of a bitter taste and pale yellow to orange-brown colour.

Cimicifuga.—The dried rhizome and roots of *Cimicifuga racemosa*, black snake root (Nat. Ord., Ranunculaceæ) ; which grows in Canada and the United States of America. The drug may be known by the remains of the numerous stout branches, curving upwards, which the rhizome bears, and from the cruciate appearance of the transverse section of the root. It is blackened by solution of ferric chloride, a reaction which distinguishes it from black hellebore root. It contains a bitter crystalline body called *Racemosin*.

The medicinal properties are analgesic (Greek, ἀν, *an*, not, and ἄλγος, *algos*, pain, signifying pain relieving) and expectorant.

The official preparations are :

1. The *Liquid Extract*—strength, 1 in 1 ; dose, 5 to 30 minims.

2. The *Tincture*—strength, 1 in 10 ; dose, $\frac{1}{2}$ to 1 fluid drachm.

Male Fern.—The dried rhizome of *Aspidium filix-mas* (Nat. Ord., Filices), collected in the autumn in this country. Colour, greenish-brown. Appearance, tufted and scaly. Male fern contains a fixed oil, *Filicic acid*, and a crystalline substance, *Aspidin*. It should not be kept for more than a year, as the filicic acid degenerates into the inactive anhydride. It is used for expelling tapeworms.

The only official preparation is the *Liquid Extract*, which is prepared by exhausting the rhizome with ether, recovering the ether and reserving the resultant oily extract. Dose, 45 to 90 minims.

Gelsemium Root.—The dried rhizome and roots of *Gelsemium nitidum* (Nat. Ord., Loganiaceæ), the yellow or Carolina Jasmine; a plant indigenous to the Southern States of the United States of America. The drug may be recognised by the radiate structure of the transverse section, the yellow colour of the root, and the purple colour of the rhizome. It contains two alkaloids, which must be carefully distinguished, although their names are unfortunately very much alike.

1. *Gelseminine:* an amorphous poisonous alkaloid, which is so powerful that ½ grain has been known to be fatal.

2. *Gelsemine:* a crystalline non-poisonous alkaloid.

To make the confusion worse, an indefinite eclectic preparation is known as *Gelsemin.* This is really a powdered extract, the dose of which is ½ to 2 grains.

Gelsemium has analgesic and antispasmodic properties, but is dangerous in large doses.

The official preparation is the *Tincture*, the strength of which is 1 in 10 and the dose 5 to 15 minims.

Rhubarb Root.—The drug so called is really the rhizome of *Rheum palmatum* and *Rheum officinale* (Nat. Ord., Polygonaceæ, from Greek, *πολύς*, *polus*, many; *γόνυ*, *gonu*, knee or joint, the members of this order having much-jointed stems). It is said to have been used by the Chinese 2,000 years before the Christian era; and it is still imported from China and Thibet, the European grown root not having found favour. Commercially, however, the drug is known as Turkey or East Indian rhubarb, as it was formerly imported by way of those countries.

The drug is found in commerce in yellow, irregularly shaped pieces, which present a marbled appearance on being broken. Rhubarb has a characteristic odour and taste; and the large amount of calcium oxalate, which it contains, renders it gritty when chewed.

Rhubarb is a cathartic and powerful hepatic stimulant, with an after astringent action, which is due to the *rheo-tannic* acid it contains. It also contains *Chrysophanic acid*, *Emodin*, *Rhein*, etc., but its cathartic properties are said to be due to a resinous body. It is given in the form of powder, the official dose of which for repeated administration is 3 to 10 grains; for a single dose, 15 to 30 grains.

The official preparations are:

1. The *Extract*—prepared by maceration and percolation with alcohol, (60 per cent.). Dose, 2 to 8 grains.

2. The *Infusion*—strength, 1 in 20; dose, ½ to 1 fluid ounce.

3. The *Concentrated Solution*—ten times the strength of the infusion; dose, ½ to 1 fluid drachm.

4. The *Compound Pill*—a combination of rhubarb with aloes, myrrh, soap, and peppermint oil. Dose, 4 to 8 grains.

5. The *Compound Powder*, which contains rhubarb magnesia, and ginger in equal proportions—the immortal prescription of Dr. Gregory. Dose, 20 to 60 grains.

6. The *Syrup*. This preparation contains oil of coriander, which disguises the flavour of the drug; but if the official process be strictly carried out, the greater part of the oil is lost by evaporation. Dose, ½ to 2 fluid drachms.

7. The *Compound Tincture*, which contains in addition to rhubarb: glycerin, cardamom seeds, and coriander fruit. Dose, ½ to 1 fluid drachm.

Turmeric.—This is the dried rhizome of *Curcuma longa* (Nat. Ord., Scitamineæ). Turmeric is cultivated in tropical countries, India, China, etc., where it is used as a condiment. It has been recommended for jaundice; but is now only employed as a colouring agent and as a test for alkalies.

Valerian.—The dried rhizome and roots of *Valeriana officinalis* (Nat. Ord., Valerianeæ). It is collected in the autumn. Although a common British plant, commercial supplies come chiefly from abroad. It is a short rhizome with numerous slender rootlets. The rootlets hold mechanically much earth, which should be removed by beating. It has a characteristic disagreeable odour, due to the presence of a volatile oil. This oil contains much free volatile acid (*va'erianic*). The valerianates used in medicine, however, are prepared artificially from amylic alcohol, as we shall see later. The drug is a nervine stimulant and tonic, being especially useful in hysteria.

The only official preparation is the *Ammoniated Tincture of Valerian*, which contains, besides valerian the oils of nutmeg and lemon and solution of ammonia. Strength, 1 in 5; dose, ½ to 1 fluid drachm.

Serpentary.—This drug consists of the rhizome and roots of *Aristolochia serpentaria*, or *Aristolochia reticulata* (Nat. Ord., Aristolochiaceæ). The former is known as Virginian snake-root, and the latter as Texan snake-root, as they were both considered to be useful in the treatment of snake-bites, but this has not been confirmed. The rhizome bears remains of aerial stems and numerous wiry roots, those of the *A. reticulata* being longer, thicker, and straighter than those of *A. serpentaria.* The smell, which is due to the presence of a volatile oil, is characteristic, and the taste is also marked.

The active principles are the volatile oil and a crystalline alkaloid, known as *Aristolochine*.

Medicinally, serpentary is stimulant and tonic, the official preparations being:

1. The *Infusion*—strength, 1 in 20; dose, ½ to 1 fluid ounce.

2. The *Concentrated Solution*—strength, 1 in 2; dose, ½ to 2 fluid drachms.

3. The *Tincture*—strength, 1 in 5; dose, ½ to 1 fluid drachm.

Serpentary also enters into the composition of compound tincture of cinchona.

Ginger.—The scraped and dried rhizome of *Zingiber officinale* (Nat. Ord., Scitamineæ). Commercially, there are three varieties of ginger: (1) Scraped or unbleached Jamaica ginger; (2) Coated or unscraped ginger; (3) Bleached ginger, which is the rhizome bleached by treatment with the fumes of burning sulphur, or by dipping in solution of chlorinated lime.

The first of these alone answers the official description.

The plant is a native of Hindustan, but is cultivated in the West Indies.

Ginger contains a volatile oil; also *Gingerol*, which is an inodorous but very pungent liquid; and a resin.

Medicinally, it is stimulant and carminative (from the Latin, *carmen*, a song, a charm, because it acts as a charm is thought to do), a medicine which expels wind, the official preparations being:

1. The *Syrup*—strength, 1 in 40; dose, ½ to 1 fluid drachm.

2. The *Tincture*—strength, 1 in 10; dose, ½ to 1 fluid drachm.

The strong tincture or essence (strength, 1 in 2) is also much used, but is not now in the Pharmacopœia.

UNOFFICIAL RHIZOMES.

Flag Root.—The sweet flag or sedge, *Acorus calamus*, a plant which is found wild in England. It belongs to the Nat. Ord. Aroideæ. It was known to the ancients, and is thought to be the same as the calamus mentioned in the Bible. It contains a volatile oil and a bitter principle, *Acorin*.

Medicinally, it is stimulant, carminative and tonic. Dose, 15 to 60 grains.

Couch Grass.—*Agropyrum* (*Triticum*) *repens* (Nat. Ord., Gramineæ). The specific name *repens* (creeping), and the English name "couch grass," refer to the creeping rhizome. Couch grass is a troublesome weed, indigenous to Europe. The drug is gathered in the autumn, deprived of its rootlets, and used for its diuretic and aperient properties. It contains about 8 per cent. of a tasteless, gummy substance, *Triticin*.

A decoction and liquid extract are official in the Indian and Colonial Addendum to the British Pharmacopœia.

Black Hellebore.—The Christmas rose, so-called because it flowers in winter, *Helleborus niger* (*niger*, black, because the roots and rhizome are black)—Nat. Ord., Ranunculaceæ—is a native of Central and Southern Europe, and is collected in Germany in the autumn. The rhizome is something like cimicifuga, but can be distinguished from that drug by its not being blackened by test-solution of ferric chloride.

It contains two poisonous crystalline glucosides, *Helleborin* and *Helleborein*, and medicinally acts as a drastic purgative and emmenagogue (promotes the menstrual discharge).

Orris.—The rhizome of the *Iris florentina*, *Iris pallida*, and *Iris Germanica* (Nat. Ord., Iridaceæ). Iris was the goddess of the rainbow. The genus Iris includes beautiful flowers of every variety of colour. Orris is cultivated in Italy, and is chiefly used for making perfumed powders, etc.

It contains about 2 per cent. of a volatile oil, which is solid at ordinary temperatures.

Blood Root.—(So-called from the colour of the juice of the rhizome), *Sanguinaria canadensis* (Nat. Ord., Papaveraceæ).

Blood root acts medicinally as a tonic, emetic, and narcotic (Greek, νάρκη, *narkē*, torpor. A drug which relieves pain, produces sleep, and in large doses stupor).

Veratrum or White Veratrum.—The rhizome of *Veratrum viride* (Nat. Ord., Liliaceæ). Indigenous to mountainous parts of Central and Southern Europe. The drug is imported from Germany.

It is poisonous, acting as a powerful emetic, purgative, and errhine (from Greek ἐν, *en*, in, and ῥίν, *rhin*, nostril —*i.e.*, a medicine acting on the mucous membrane of the nostrils). Dose, 1 to 2 grains.

It is used in the form of ointment as a parasiticide.

American or Green Veratrum.—A native of the eastern parts of the United States of America.

Medicinal properties: Emetic, diaphoretic, sedative, errhine. Dose, 1 to 2 grains.

Bulb.

A bulb is an underground stem consisting of a flat axis with numerous fleshy leaves. The best-known example is the onion.

Squill is the dried sliced bulb of *Urginea scilla* (Nat. Ord., Liliaceæ), a plant which grows in the countries on the Mediterranean coast. It is inodorous, but has a bitter, disagreeable taste. It contains three bitter principles: *Scillitoxin*, *Scillipicrin*, and *Scillin*.

Medicinally, squill acts as a mild purgative and diuretic, also as a cardiac tonic; but its chief use is as a stimulant. Dose of the dried drug, 1 to 3 grains.

The official preparations are:

1. The *Vinegar*—strength, 1 in 8; dose, 10 to 30 minims.

2. *Oxymel of Squill*—strength about 1 in 15; dose, ½ to 1 fluid drachm.

3. The *Compound Pill of Squill*—strength about 1 in 5; dose, 4 to 8 grains.

4. The *Syrup*—strength about 1 in 24; dose, ½ to 1 fluid drachm.

5. The *Tincture*—strength about 1 in 5; dose, 5 to 15 minims.

Corm.

A corm is an underground stem, which resembles a bulb, but is more solid.

Colchicum.—The only official representative of this class is the corm of the meadow saffron (*Colchicum autumnale;* Nat. Ord., Liliaceæ). The corms should be collected in the early summer, when they are filled with reserve material for the nourishment of the plant. They are used in both the fresh and dried state. The fresh corms yield a milky juice and have a bitter taste and disagreeable odour. The dried drug is in slices which are reniform (kidney-shaped).

Medicinally, colchicum is used for the relief of the pain and inflammation of gout. It contains a poisonous alkaloid, *Colchicine*, which is present to the extent of about 0·5 per cent. of the dried corm.

The official preparations are:

1. The *Extract*, which is made by crushing *fresh* corms (deprived of their coats), pressing out the juice and evaporating it. Dose, ¼ to 1 grain.

2 The *Wine*, which is made by macerating the *dried* drug in sherry. Strength, 1 in 5; dose, 10 to 30 minims.

CHAPTER III.

Stems, Woods, and Barks.

STEMS.

Woody Nightshade or Bittersweet (*Unofficial*).—The dried young stems and branches of *Solanum dulcamara* (probably from Latin, *solor*, I soothe ; *dulcis*, sweet ; *amara*, bitter, so called because the drug has a bitter taste and sweet after-taste), Nat. Ord., Solanaceæ. The shrub flourishes throughout Europe, except in the extreme North.

The drug contains an alkaloid, *Solanine* (which is found also in the potato, *Solanum tuberosum*), and a glucoside, *Dulcamarin*. It is a feeble narcotic, and is used in cases of chronic rheumatism, and both externally and internally for skin diseases.

WOODS.

Guaiacum Wood.—The heart-wood (older internal portion) of *Guaiacum officinale*, or *G. sanctum* (Nat. Ord., Zygophylleæ). Also called *Lignum vitæ* and *L. sanctum*, because of its healing properties. Indigenous to the West Indies. The wood is very hard and dense and sinks in water. It has an acrid taste, due to the resin, of which it contains about 25 per cent.

Medicinally, the drug is a mild diaphoretic and emmenagogue, and it relieves the pain of chronic rheumatism. The wood is one of the ingredients in concentrated compound solution of sarsaparilla.

The official preparations are :

1. The *Resin*—dose, 5 to 15 grains.

2. *Guaiacum Mixture*—strength, 1 in 40 ; dose, ½ to 1 fluid ounce.

3. *Ammoniated Tincture*—strength, 1 in 5 ; dose, ½ to 1 fluid drachm.

4. *Guaiacum Resin Lozenges*—3 grains of resin in each.

The resin is also contained in compound calomel pill.

Logwood.—The unfermented heart-wood of *Hæmatoxylon campechianum* (Greek, αἷμα, *haima*, blood ; ξύλον, *xylon*, wood, so-called because the heart-wood is a deep-red colour), from Campeachy, in Mexico (Nat. Ord., Leguminosæ). A native of Central America. The drug is astringent and tonic. It contains a crystalline principle, *Hæmatoxylin*, and some tannin.

The official preparation is the *Decoction*—strength, 5 per cent. ; dose, ½ to 2 fluid ounces.

Red Sanders Wood, or Red Sandal-Wood.—The heart-wood of *Pterocarpus santalinus* (Greek, πτερόν, *pteron* a wing ; καρπός, *karpos*, fruit, so-called because it has a winged fruit). Nat. Ord., Leguminosæ. Indigenous to and cultivated in Southern India. The wood was formerly thought to have medicinal properties, but is now only used as a colouring agent. It contains a crystalline resinoid substance, known as *Santalin*, or *Santalic Acid*.

It is used in making compound tincture of lavender.

Quassia Wood.—The wood of the trunk and branches of *Picræna excelsa* (Greek, πικρός, *pikros*, bitter ; Latin, *excelsa*, high). The tree is about 60 feet high (Nat. Ord., Simarubeæ). A native of the *West Indies*. The name "Quassia" is from Quassy, a negro who made known the properties of the wood. The wood contains a bitter principle, *Picrasmin*.

Medicinally, quassia is a bitter tonic without astringency; and, as it contains no tannin, it is suitable for prescribing with iron.

The official preparations are:

1. The *Infusion*, which is made with cold water. Strength, 1 per cent.; dose, ½ to 1 fluid ounce.

2. The *Concentrated Solution*, which is made with weak alcohol (20 per cent.). Strength, 10 per cent.; dose, ½ to 1 fluid drachm.

3. The *Tincture*, which is made with alcohol (45 per cent.). Strength, 1 in 10; dose, ½ to 1 fluid drachm.

Wood Charcoal.—Prepared by exposing wood to a red heat without access of air. Wood charcoal is administered internally as an absorbent and deodorizer, and is applied externally to putrid sores, etc.

(Wood charcoal deodorises; animal charcoal decolourises.)

BARKS.

Cascara Sagrada.—The name is Spanish for "Sacred Bark." It is the dried bark of *Rhamnus purshianus* (Nat. Ord., Rhamnaceæ), a small tree found in California. The bark is collected in the spring and early summer, as it is then easily peeled off. The drug, which is imported from the United States, occurs in commerce in quills or nearly flat pieces. Externally, the bark is often covered with silver-grey lichen. The inner surface is reddish-brown and becomes darker with age. The drug has a slight odour and very intense bitter taste.

The medicinal properties are those of a laxative, and if the drug be kept for a year or two before use it does not gripe. This is due to the fact that the fresh bark contains a ferment, which becomes exhausted when the drug is kept for some time. The bark also contains resins and a glucoside known as *Purshianin*.

The official preparations are :

1. The *Solid Extract*, which is prepared by macerating and percolating the drug with water until it is exhausted (it having been proved that water extracts the full activity of the bark), and evaporating the product to dryness. Strength, about 4 in 1 ; dose, 2 to 8 grains.

2. The *Liquid Extract*—this is also made by exhausting the drug with cold water, but the finished product contains 20 per cent. rectified spirit, which is added as a preservative. Strength, 1 in 1 ; dose, ½ to 1 fluid drachm.

3. The *Aromatic Syrup*, in which the nauseous taste of the drug is disguised by means of tincture of orange, syrup, and cinnamon water. Strength, 1 in 2½ ; dose, ½ to 2 fluid drachms.

Alder Buckthorn (*Unofficial*).—The dried bark of *Rhamnus frangula* (Nat. Ord., Rhamnaceæ). This drug has similar properties to those of cascara sagrada. The bark should be kept for at least twelve months before being used.

Cascarilla, or little bark, was so-called because it was mistaken for a species of cinchona, the most important bark used in medicine. The drug is the dried bark of *Croton eluteria* (Nat. Ord., Euphorbiaceæ), a shrub which is a native of the Bahama Islands. It occurs in commerce in small quills or curved pieces. The odour of cascarilla is agreeable, especially when burned, and it is sometimes used with tobacco. The taste is bitter and nauseous. Cascarilla contains a bitter crystalline alkaloid, *Cascarilline*, and about 1 per cent. of a volatile aromatic oil.

Medicinally, it is an aromatic tonic.

The preparations are :

1. The *Infusion*, which is made with boiling water. Strength, 1 in 20 ; dose, ½ to 1 fluid ounce.

2. The *Tincture*, made by percolating the powdered drug with alcohol (70 per cent.). Strength, 1 in 5 ; dose, ½ to 1 fluid drachm.

Cinchona Bark is undoubtedly the most popular and most valuable of all the barks used in medicine. Its history is interesting. The Cinchonas are natives of South America, and the bark was first used by Europeans for the cure of fever in the seventeenth century. Amongst the cured were a Jesuit missionary and the Countess of Chinchon, the wife of the then Viceroy of Peru. The latter, on her recovery, gave away large quantities of the drug, and her name has been immortalised in the name of the genus. The powdered drug has also been called Countess's powder, and the bark is sometimes known as Jesuit's bark. The great demand which sprang up for the drug led to the destruction of many of the sources of supply, and hence cinchona is now extensively cultivated in countries other than those of which it is a native. There are a very large number of species, but the only one recognised officially is the *Cinchona succirubra* (Latin, *succus*, juice ; *rubra*, red, so-called because the sap from this species becomes red on exposure to the air), Nat. Ord., Rubiaceæ. We are directed to use the dried bark of the stem and branches of cultivated plants. The bulk of the supply comes from India.

Cinchona bark contains several alkaloids, the principal of which are *Quinine* (from the Indian word *quina*, bark), *Cinchonidine*, *Cinchonine*, and *Quinidine*. For making galenical preparations only such bark may be used as yields from 5 to 6 per cent. total alkaloids, of which at least half consists of quinine and cinchonidine, when estimated by the official process. The official process of assay is briefly as follows: (1) The alkaloids are freed from combination by the action of calcium hydroxide on the powdered bark; (2) The alkaloids are dissolved out of the mixture by means of benzolated amylic alcohol; (3) the alkaloids are converted into *hydrochlorates* by the addition of hydrochloric acid; (4) the quinine and cinchonidine are precipitated as insoluble *tartrates* by the addition of a nearly-saturated solution of sodium potassium tartrate to the neutralised solution; (5) The remaining alkaloids are precipitated from the filtrate by the addition of excess of ammonia.

Medicinally, cinchona is valuable as a febrifuge; it is also tonic and astringent.

The official preparations are:

1. The *Liquid Extract*, which is made by exhausting the drug by percolation with acidulated water to which a little glycerin has been added. The finished product is standardised to contain 5 per cent. total alkaloids. Dose, 5 to 15 minims.
2. The *Acid Infusion*, which is made by infusing the powdered drug in boiling water acidulated with aromatic sulphuric acid for one hour. Strength, 1 in 20; dose, ½ to 1 fluid ounce.
3. The *Tincture*, which is prepared by percolation with alcohol (70 per cent.), and standardized to contain about 1 per cent. total alkaloids. Dose, ½ to 1 fluid drachm.
4. The *Compound Tincture*—a mixture of the simple tincture with a preparation made by macerating bitter orange-peel, serpentary rhizome, cochineal, and saffron in alcohol (70 per cent.). Strength, 0·5 per cent. total alkaloids; dose, ½ to 1 fluid drachm.

Three salts of quinine are official:

1. The HYDROCHLORIDE, which is fairly soluble in water (about 1 in 35), and soluble in alcohol, 90

per cent. (1 in 3). Dose, 1 to 10 grains. From it are made:

(*a*) *Tincture of Quinine*, 1 part of the salt dissolved in 500 fluid parts of tincture of orange. Dose, ½ to 1 fluid drachm; (*b*) *Quinine Wine*, 20 grains dissolved in a pint of orange wine. Dose, ½ to 1 fluid ounce.

2. ACID HYDROCHLORIDE OF QUININE. This salt is soluble in less than its own weight of water. It is used in the preparation of iron and quinine citrate. Dose, 1 to 10 grains.

3. SULPHATE OF QUININE, the cheapest and most generally used salt of quinine, often called *Quinine*. It is very slightly soluble in water (about 1 in 800), but is readily soluble in acidulated water, and hence in gastric juice. Dose, 1 to 10 grains.

The preparations of the sulphate are:

(*a*) *Quinine sulphate pill.*

(*b*) *Ammoniated tincture of quinine.* One fluid drachm contains about 1 grain of the sulphate. Dose, ½ to 1 fluid drachm.

The principal UNOFFICIAL CINCHONAS are:

Calisaya, or yellow bark, the product of the *Cinchona calisaya*, which grows in Bolivia and Peru.

Columbian or *Carthagena* bark, the product of *Cinchona lancifolia*. It is found in New Granada.

Both these varieties are used for the manufacture of the salts of quinine.

Cinnamon Bark is the inner bark of the *Cinnamomum zeylanicum* (Latin for Ceylonese). Nat. Ord., Laurineæ. A native of Ceylon. The young tree is pruned in order to form a stock from which shoots are allowed to grow. These are cut when from one to two years old and the bark removed. After exposure, the outer portion is removed by scraping.

Cinnamon contains about 1 per cent. of a volatile oil. Medicinally, it is carminative and astringent, but it is chiefly used in combination with other remedies.

The principal official preparations are :

1. The *Water*, which is prepared by distillation.
2. The *Volatile Oil*—dose, ½ to 3 minims.
3. The *Compound Powder*, which contains in addition to powdered cinnamon bark : powdered cardamom seeds and powdered ginger. Strength, 1 in 3 ; dose, 10 to 40 grains.
4. The *Spirit*, which is a 10 per cent. solution of the oil in alcohol (90 per cent.). Dose, 5 to 20 minims.
5. The *Tincture*, 1 of the bark in 5 alcohol (70 per cent.). Dose, ½ to 1 fluid drachm.

An UNOFFICIAL bark is :

Cassia Bark, or Chinese cinnamon, the bark of *Cinnamomum cassia*, which is cultivated in the South of China. It contains a volatile oil, and has similar properties to those of cinnamon.

Cusparia is the dried bark of *Cusparia febrifuga* (Nat. Ord., Rutaceæ). A small tree which grows in Venezuela. It is sometimes known as Angostura bark, from the Venezuelan town of that name. Cusparia bark has an outer soft layer of cork, and a hard dark-brown inner layer. The fracture is short, and on the fractured surface numerous white points can be seen with the naked eye. These consist of calcium oxalate. The bark of *Strychnos Nux Vomica* was many years ago mistaken for cusparia, with somewhat serious results, but there should be no difficulty in distinguishing the two.

Four alkaloids have been found in the bark, *Galipine*, *Galipidine*, *Cusparine*, and *Cusparidine* ; also about 1½ per cent. of an essential oil, a bitter principle, *Angosturin*, and a glucoside.

Medicinally, the drug is tonic and febrifuge, the official preparations being:

1. The *Infusion*—strength, 1 in 20; dose, 1 to 2 fluid ounces.

2. The *Concentrated Solution*—strength, 1 in 2; dose, ½ to 1 fluid drachm.

Mezereon Bark.—The dried bark of *Daphne Mezereum*, *D. Laureola*, *D. Gnidium* (Nat. Ord., Thymelæaceæ). These are all indigenous to Europe. The bark is found in commerce in the form of tough fibrous strips or in quills.

The drug has alterative and diuretic properties, but is seldom given internally, although it enters into the composition of the concentrated compound solution of sarsaparilla. Externally, it is used as an irritant, generally in the form of an ointment.

Mezereon bark contains a glucoside, *Daphnin*, but its activity is thought to be due to the presence of a resin or resinoid body, which is called *Mezerein*.

Virginian Prune or Wild-Cherry Bark.—The dried bark of the *Prunus serotina* (Latin, *late*, so-called because it flowers later than other species of Prunus), Nat. Ord., Rosaceæ). A native of North America. The bark should be collected in the autumn, as it then yields more hydrocyanic acid (according to one experimenter, about three times as much) than in the earlier part of the year; it is better also to use the recently-dried bark, as it deteriorates on keeping.

The drug has tonic and sedative properties. The latter are due to the presence of hydrocyanic acid, which is formed when the drug is treated with water. Wild-cherry bark, in common with bitter almonds, cherry laurel leaves, and other plant products, contains a glucoside, known as *Amygdalin*, and a ferment, *Emulsin*. In presence of water, the ferment splits up the glucoside into an essential oil (benzaldehyde), hydrocyanic (prussic) acid, and glucose:

There are two official preparations:

1. The *Syrup*, which is chiefly used as a flavouring agent. Strength, 3 in 20; dose, ½ to 1 fluid drachm.

2. The *Tincture*. Strength, about 1 in 5; dose, ½ to 1 fluid drachm.

In making both these preparations, the drug is first treated with water.

Quillaia Bark, Panama Bark, Soap Bark.—The inner portion of the bark of *Quillaja saponaria* (from the Chilian word *quillean*, to wash, and Latin *sapo*, soap, so called because the bark produces a lather with water), Nat. Ord., Rosaceæ. The tree is indigenous to Chili and Peru, but is cultivated in Northern Hindustan.

Medicinally, quillaia is an expectorant, and has been proposed as a substitute for senega, as it contains the two glucosides, *Quillaic Acid* and *Sapotoxin*, which are thought to be identical with *Polygalic Acid and Senegin* (see p. 22). Its powder is, however, very irritating (as every apprentice who has brayed it in a mortar knows), and it therefore should not be used in cases where there is ulceration of the throat.

The official preparation is:

The *Tincture*. Strength, 1 in 20; dose, ½ to 1 fluid drachm.

The tincture is used as an emulsifying agent in the preparation of *Solution of coal-tar*.

Hamamelis or Witch-Hazel Bark, so-called because its leaves resemble those of the English hazel, the stems of which were used as the divining-rod of witches. The dried bark of *Hamamelis Virginiana*, (Greek, ἅμα, *hama*, with; μῆλον, *mēlon*, fruit, because the fruit of one year remains on the shrub with the flower of the next), a native of Virginia, U.S.A. (Nat. Ord., Hamelideæ). Collected in the spring.

Medicinally, the bark is astringent and hæmostatic, and is used both internally and locally. The cause of its action is uncertain, but it contains some tannin and a volatile oil.

The official preparation is:

The *Tincture*. Strength, 1 in 10; dose, ½ to 1 fluid drachm.

The drug is also the active principle of various much-vaunted nostrums, which it is unnecessary to advertise here.

UNOFFICIAL BARKS.

Casca or Sassy Bark.—The bark of *Erythrophlœum guineense* (Nat. Ord., Leguminosæ). Indigenous to Western and Central Africa, where the bark is used by the natives in trials for witchcraft; hence called *Ordeal Bark*.

The drug closely resembles digitalis in its physiological effects. It contains an alkaloid, *Erythrophlœine*, the dose of which is $\frac{1}{40}$ grain.

Bebeeru Bark.—The dried bark of *Nectandra rodiæi* (Greek, *νέκταρ*, *nektar*, the drink of the gods, and *ἀνήρ*, *anēr*, male, because a sweet substance is found at the base of the stamen or male organ, *rodiæi* from Dr. Rodie, who discovered its medicinal virtues), Nat. Ord., Laurineæ. A native of Guiana, where the wood is used for shipbuilding under the name of Greenheart.

Medicinally, the drug is a tonic and febrifuge. It contains several alkaloids, the chief of which is *Beberine*.

Commercial *Sulphate of Beberine* is a mixture of the sulphates of the various alkaloids obtained from the bark.

Canella Bark.—The dried bark of *Canella alba*, the wild cinnamon (Nat. Ord., Canellaceæ), a native of the West Indies. Canella has a pleasant odour, like that of cinnamon. A specimen kept in the British Museum was found to have retained its fragrance for nearly 200 years.

The drug is little used in medicine, but has stimulant and tonic properties. Dose, 10 to 30 grains.

Coto Bark.—The botanical source of this bark, which is imported from Bolivia, is unknown. It contains a crystalline principle, *Cotoin*.

Medicinally, the drug has been used in diarrhœa. Dose, 5 to 10 grains.

The preparations are:

1. *Tincture* (British Pharmaceutical Conference Formulary). Strength, 1 in 10; dose, 10 to 30 minims.
2. *Cotoin.* Dose, $\frac{1}{2}$ to 2 grains.

Larch Bark.—The bark of *Larix europea* (Nat. Ord., Coniferæ). Indigenous to Central and Southern Europe. The name *larix* is probably from the Celtic word *lar*, fat, and refers to the oleo-resin secreted by the tree, which is known in commerce as Venice turpentine.

The bark has astringent and styptic properties.

Oak Bark.—The dried bark of *Quercus robur* (Greek *ῥω*, *rhō*, strong), Nat. Ord., Cupuliferæ. Indigenous to this country.

Oak bark is very astringent, owing to the quercitannic acid which it contains.

Elm Bark.—The dried inner bark of *Ulmus campestris* (Latin words connected with the Saxon *ulm*, or elm, and *campestra*, a plain), Nat. Ord., Urticaceæ. The common European elm.

Medicinal properties, demulcent and astringent. Contains mucilage and tannic acid.

Slippery Elm Bark, so-called, because the inner bark contains much mucilaginous matter. The inner bark of *Ulmus fulva* (Nat. Ord., Urticaceæ). Indigenous to the U.S.A.

Used for its demulcent properties.

CHAPTER IV.

Leaves, Plant Tops, and Whole Plants.

Leaves.

Belladonna Leaves.—The fresh leaves and branches of *Atropa Belladonna* (Nat. Ord., Solanaceæ). Collected when the plant is in flower (see Belladonna Root). The amount of alkaloids present in the leaves is very variable, but good specimens yield *about* 0·5 per cent. of the dried leaves, which is equivalent to rather less than 0·1 per cent. of the fresh leaves.

For medicinal properties, see Belladonna Root.

The preparations are:

1. *Green Extract of Belladonna.* This extract is made by (1) expressing the juice; (2) heating to 130° F., and straining out the green colouring matter; (3) heating to 200° F., and filtering to remove albuminous matter; (4) evaporating to syrupy consistence; (5) replacing the green colouring matter; (6) evaporating to the consistence of a soft extract. The average alkaloidal strength of commercial extracts is about 1 per cent., but as the preparation is not standardised, the strength is very variable. Dose, $\frac{1}{4}$ to 1 grain.

2. *Belladonna Juice.* The expressed juice is preserved by the addition of $33\frac{1}{3}$ per cent. of alcohol (90 per cent.). Strength, about ·05 per cent.; dose, 1 to 2 fluid drachms.

Buchu Leaves.—The dried leaves of *Barosma betulina* (Greek, *βαρύς*, *barus*, heavy, *ὄσμη*, *osmē*, an odour—plants of this genus have a strong smell; Latin, *betula*, a birch, because the leaves are shaped like those of the birch), Nat. Ord., Rutaceæ. The leaves of this species are known commercially as "short buchu." The plant is a small shrub, a native of Cape Colony, where the leaves are collected while the plant is flowering and bearing fruit. The use of the drug was learnt from the Hottentots, and the word *buchu*, or *buku*, is the native name for the plant. The leaves contain about 1½ per cent. of a volatile oil. This contains a stearopten,* *Diosphenol*, which has been found to have antiseptic properties.

Medicinally, the drug is tonic and diuretic. Dose, 10 to 40 grains.

The preparations are:

1. The *Infusion*. The leaves are broken (not bruised, because they contain mucilage), and infused in boiling water for fifteen minutes. Strength, 1 in 20; dose, 1 to 2 fluid ounces.

2. The *Tincture*—made by percolating the powdered leaves with alcohol (60 per cent.). Strength, 1 in 5; dose, ½ to 1 fluid drachm.

Coca or Cuca Leaves.—The dried leaves of *Erythroxylum Coca* (Greek, *ἐρυθρός*, *erythros*, red; *ξύλον*, *xylon*, wood, so-called because some species have reddish wood), Nat. Ord., Lineæ. The plant is cultivated in Bolivia and Peru, the commercial varieties, the use of which is officially sanctioned, being known as Huanuco (Bolivian) and Truxillo (Peruvian) coca. Coca leaves are stimulant and tonic, and have been used by travellers and others who have to endure great physical exertion.

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* *Stearoptens* (Greek, *στέαρ*, *stear*, suet) are those portions of volatile oils which distil over last, and are usually solid at ordinary temperatures.

When chewed they produce a sensation of numbness, which is due to the active principle, the alkaloid, *Cocaine*. The total alkaloidal content of the leaves averages about 0·5 per cent.

The official preparations are :

1. The *Liquid Extract*—strength, 1 in 1; dose, ½ to 1 fluid drachm.

2. The *Alkaloid, Cocaine.* This is very insoluble in water, but soluble in fats and oils. From it is prepared *Cocaine Ointment*—strength, 1 in 25.

3. *Hydrochloride of Cocaine.* This salt is very soluble in water. It is very valuable as a local anæsthetic, but must be administered with great caution. Dose, ⅕ to ½ grain.

The preparations of the hydrochloride are :

(*a*) *Hypodermic Injection*—strength, 10 per cent.; dose, by subcutaneous injection, 2 to 5 minims.

(*b*) *Discs of Cocaine.* These are tiny gelatin discs for application to the eye, each containing $\frac{1}{50}$ grain of the hydrochloride.

(*c*) *Rhatany and Cocaine Lozenges.* Each lozenge contains $\frac{1}{20}$ grain of the hydrochloride.

It is important to distinguish clearly between *Coca*, *Cocoa*, and *Cokernut.* None of these plant products are related botanically, but the similarity of their names may lead to confusion. *Coca* is described above. *Cocoa* is prepared from the fruit of *Theobroma cacao*, which is described under Cocoa Seeds (p. 94). The *Cokernut* is the fruit of the coco-nut palm, *Cocos nucifera.* To make the confusion worse, a proprietary nostrum for the hair has been arbitrarily called "koko."

Digitalis Leaves.—The dried leaves of *Digitalis purpurea* (Latin, "purple finger," in allusion to the colour of the corolla, which is shaped like the finger of a glove; hence also the common English name fox = folk's = fairy's glove), Nat. Ord., Scrophularineæ. The plant grows wild in England, and is cultivated for medicinal purposes both here and in Germany. It is officially directed that the leaves should be collected when the plant is beginning to flower, as they are thought to be more active then, and the characteristic appearance of the flower prevents any possibility of mistake. Digitalis contains at least two principles, the glucosides *Digitalin* and *Digitoxin*, but it is doubtful to what constituent its activity is due, and no trustworthy method of chemical standardisation has yet been devised.

The drug acts as a cardiac tonic, general tonic, and diuretic. Dose, of the dried leaves, ½ to 2 grains.

The preparations are :

1. The *Infusion*, made with boiling water—strength, 1 in 146 ; dose, 2 to 4 fluid drachms.

2. The *Tincture*, made with alcohol, 60 per cent.—strength, 1 in 8 ; dose, 5 to 15 minims.

Hyoscyamus (Henbane) Leaves.—The leaves and flowering-tops of *Hyoscyamus niger* (Greek, ὗς, *hus*, a pig ; κύαμος, *kuamos*, a bean, because pigs were supposed to be immune to the effects of the seeds, which are poisonous to other animals—the English name indicates the effect of the plant on poultry ; *niger*, Latin, black, so-called because the corolla of this species has dark purple markings), Nat. Ord., Solanaceæ. Both the fresh and dried leaves and flowering-tops are used in medicine. They are collected from flowering biennial plants, cultivated in England and Germany. They contain the alkaloids, *Hyoscyamine*, *Atropine*, and *Hyoscine*, but the total alkaoidal content is only about one-eighth that of belladonna leaves, and the medicinal action is therefore milder.

The official preparations are :

(*a*) From the fresh leaves and tops :

1. The *Green Extract*—prepared similarly to the green extract of belladonna. Dose, 2 to 8 grains.

2. The *Juice*—the expressed juice preserved with alcohol (90 per cent.). Dose, ½ to 1 fluid drachm.

(*b*) From the dried drug:

3. The *Tincture*—strength, 1 in 10; dose, ½ to 1 fluid drachm.

The official salts of the alkaloids *Hyoscyamine* and *Hyoscine*, although not necessarily obtained from henbane, may be conveniently mentioned here. They are:

1. *Hydrobromide of Hyoscine* (Syn.: *Scopolamine Hydrobromide*). Hyoscine is contained in hyoscyamus leaves, different species of scopola, and possibly other solanaceous plants. It is a powerful hypnotic, and useful in mania and delirium. Dose, of the hydrobromide, $\frac{1}{200}$ to $\frac{1}{100}$ grain.

2. *Sulphate of Hyoscyamine.* The medicinal properties of hyoscyamine are similar to those of hyoscine. Dose of the sulphate, $\frac{1}{200}$ to $\frac{1}{100}$ grain.

Jaborandi Leaves.—The dried leaflets of *Pilocarpus jaborandi* (Greek, πῖλος, *pilos*, a hat; καρπός, *karpos*, fruit, so-called because each of the five divisions of the fruit is shaped like a hat), Nat. Ord., Rutaceæ. Imported from Brazil. The genuine drug is very scarce in commerce, other species of Pilocarpus being substituted for it. *P. jaborandi* contains from 0·5 to 1 per cent. of alkaloids, chiefly *Pilocarpine.*

Medicinally, jaborandi is a sialogogue (increases the flow of saliva), a galactagogue (increases the secretion of milk), and a diaphoretic. Preparations of the drug are also used as hair tonics.

The official preparations are:

1. The *Liquid Extract*—strength, 1 in 1; dose, 5 to 15 minims.

2. The *Tincture*—strength, 1 in 5; dose, ½ to 1 fluid drachm.

3. *Nitrate of Pilocarpine*—the nitrate of the alkaloid,

to which the medicinal properties of jaborandi are chiefly due. Dose, $\frac{1}{20}$ to $\frac{1}{2}$ grain.

Atropine is antagonistic to pilocarpine, and serves as a valuable antidote in cases of poisoning by that alkaloid.

Cherry-Laurel Leaves.—The fresh leaves of *Prunus Laurocerasus*. The English name refers to the resemblance of the leaves to those of the laurel, and of the fruit to a cherry. Nat. Ord., Rosaceæ. An evergreen shrub cultivated in England and other temperate parts of Europe. The leaves are thick, shiny, and leathery; when bruised they yield an odour of bitter almonds, due to the presence of benzaldehyde, which is formed, together with prussic acid, by the action of a ferment on a glucoside (see p. 45).

Medicinally, cherry-laurel leaves are sedative, owing to the presence of hydrocyanic acid.

The official preparation is *Cherry-Laurel Water*. This is made by distilling the crushed leaves with water, and standardising the distillate to a strength of 0·1 per cent. hydrocyanic acid. Dose, $\frac{1}{2}$ to 2 fluid drachms.

Senna Leaves.—The use of senna in medicine is very ancient, it having been introduced into Europe by Arabian physicians. *Sena* is the Arabic name for the drug. Two commercial varieties are recognised in the Pharmacopœia:

1. **Alexandrian Senna.**—The dried leaflets of *Cassia acutifolia* (Nat. Ord., Leguminosæ), which are collected by Bedouins in the Middle and Upper Nile district, and exported viâ Alexandria. The leaflets are pale greyish-green, about 1 inch in length, lanceolate, unequal at the base, and have distinct veins on the under surface.

2. **East Indian or Tinnevelly Senna.**—The dried leaflets of *Cassia angustifolia* (Latin, *angustus*, narrow), cultivated in Southern India. The leaflets are very

similar to Alexandrian senna, but are somewhat longer, and are usually found in commerce less broken.

The active principle of senna is a glucoside, called *Cathartic Acid.* Medicinally, senna is a purgative, but causes griping if given alone.

The official preparations are:

1. *Confection* (Syn.: *Lenitive electuary*), a pleasant combination of figs, prunes, cassia, coriander, tamarinds, liquorice, and sugar with senna. Dose, 60 to 120 grains.

2. The *Infusion*—senna 1 in 10, with a little ginger. Dose, ½ to 1 fluid ounce. From this is made the compound mixture of senna (black draught).

3. The *Concentrated Solution*—ten times the strength of the infusion; dose, ½ to 1 fluid drachm.

4. *Syrup of Senna.* Senna is exhausted by repeated maceration with alcohol (20 per cent.) and pressure. Sugar is dissolved in the resulting product by the aid of heat, and when cool a little oil of coriander dissolved in strong spirit is added. Strength, about 1 in 2¼; dose, ½ to 2 fluid drachms.

5. *Compound Tincture of Senna.* Contains senna (1 in 5), with raisins, caraway fruit, and coriander. The drugs are macerated with alcohol (45 per cent.). Dose, ½ to 1 fluid drachm for repeated administration; 2 to 4 fluid drachms for a single dose.

6. *Compound Liquorice Powder*, already described under Liquorice (p. 14). It owes most of its activity to the senna which it contains (1 in 6).

Stramonium Leaves.—The dried leaves of *Datura stramonium* (Nat. Ord., Solanaceæ), the thorn-apple, so-called because its fruit is covered with spines. The leaves are ovate in shape, stalked, and about 4 to 6 inches long, unequal at base, with a sinuate, dentate margin and acuminate apex. The upper surface of the dried leaves is minutely wrinkled. The plant is cultivated in

England, but much of the drug found in commerce comes from the Continent.

Stramonium leaves contain about 0·4 per cent. of the alkaloids *Hyoscyamine* and *Atropine*, the mixed alkaloids being sometimes called *Daturine*. They have similar medicinal properties to those of belladonna, and are smoked for the relief of asthma.

The official preparation is the *Tincture*, which is made by percolating the leaves with alcohol (45 per cent.). Strength, 1 in 5; dose, 5 to 15 minims.

Bearberry Leaves. — The dried leaves of *Arctostaphylos Uva ursi* (Greek, ἄρκτος, *arktos*, a bear; σταφυλή, *staphulē*, a bunch of grapes; Latin, *uva*, a berry; *ursus, -i*, a bear), Nat. Ord., Ericaceæ. An evergreen shrub found throughout the greater part of the Northern Hemisphere, especially in mountainous places. The leaves are yellowish-green, spoon-shaped, and leathery. They are about ¾ inch long, with a very short stalk, an entire margin and smooth upper surface.

Medicinally, bearberry leaves are astringent and tonic, and have an antiseptic action on the urinary tract. They contain tannin and a glucoside, *Arbutin*.

The official preparation is the *Infusion*—strength, 1 in 20; dose, ½ to 1 fluid ounce.

Hemlock Leaves. — The fresh leaves and young branches of *Conium maculatum* (Latin, spotted), Nat. Ord., Umbelliferæ. Hemlock is a common wild plant in this country. It has a smooth spotted stem with much-divided leaves. On being crushed the plant emits a disagreeable, mouselike odour, which is due to the presence of a volatile liquid alkaloid, *Conine*.

Medicinally, hemlock is sedative and narcotic, and in large doses poisonous; but it does not dull the intellectual faculties, as is evident from the classic example of the death of Socrates.

The preparations are:

1. *Hemlock Juice*—the expressed juice of the fresh leaves and young branches, preserved by the addition of alcohol (90 per cent.). Dose, 1 to 2 fluid drachms.

2. *Hemlock Ointment.*—This is made by evaporating the preserved juice to one-eighth of its volume, and mixing it with hydrous wool fat.

Hamamelis or Witch-Hazel Leaves.—The leaves of the *Hamamelis virginiana* (see p. 46). Witch-hazel leaves are from 3 to 6 inches long, broadly oval, unequal at the base, with a rounded apex and sinuate margin. They are pinnately (like a feather) veined, the veins being prominent on the under surface.

The preparations are:

(*a*) From the fresh leaves:

1. *Solution of Hamamelis*—Prepared by distillation. This preparation cannot be made in this country, as the fresh leaves are not available here.

(*b*) From the dried leaves:

2. The *Liquid Extract.* The leaves are exhausted by percolation with alcohol (45 per cent.). Strength, 1 in 1; dose, 5 to 15 minims.
3. *Hamamelis Ointment.*—This is made by mixing 1 fluid part of the liquid extract with 9 parts hydrous wool fat.

UNOFFICIAL LEAVES.

Aconite Leaves.—The fresh leaves and flowering tops of *Aconitum Napellus* (see p. 8).

Tobacco Leaves.—The dried leaves of *Nicotiana tabacum* (Nicotiana from Nicot, the ambassador who introduced the plant into France—*tobaco* was the Indian name for a pipe) and *Nicotiana acuminata*, Nat. Ord., Solanaceæ. These plants are natives of America, but are cultivated in other temperate and sub-tropical countries.

The active principle of tobacco is a volatile liquid alkaloid, *Nicotine.* It exists in the leaf in combination with an acid, and is then non-volatile, and it is not found in tobacco smoke. It is a deadly poison.

Medicinally, tobacco is now seldom used. When smoked in moderation it has a sedative action. Taken internally, it acts as a powerful emetic, and an enema was formerly official, but its use in both these ways is dangerous.

Matico Leaves.—The dried leaves of *Piper angustifolium* (Latin, *angustus*, *-a*, *-um*, narrow; *folium*, a leaf), Nat. Ord., Piperaceæ. Indigenous to Peru. The leaves, which have very short stalks, are from 4 to 8 inches long, oblong lanceolate in shape, unequal at the base, margin entire or minutely crenulate, veins prominent on the under surface.

Medicinally, matico leaves are tonic and stimulant, being especially useful in inflammation of the urinary passages, and styptic when applied locally to small bleeding wounds.

The leaves contain a volatile oil, some tannin, a bitter principle, and artanthic acid.

PLANT TOPS.

Indian Hemp (Cannabis Indica). — The dried flowering or fruiting tops of the female plant *Cannabis sativa.* Hemp is a diœcious (Greek, *δις*, *dis*, twice; *οἶκος*, *oikos*, house, so-called because the male and female grow on different plants) herb, which is cultivated in temperate regions for the sake of its fibre and seeds. The plant, grown in India, is used for medicinal purposes, as it alone has sufficient resin to make the drug of value. The drug comes into commerce in compressed, rough, dark-green masses, which are known as "ganja."

Indian hemp is a narcotic, having similar effects to those of alcohol and opium, and the dried leaves are much used in the East under the names of "bhang" and "hashish."

In European medicine the masses, as above ("ganja"), are used for their narcotic, anodyne, and antispasmodic properties.

The drug contains a volatile oil and a resin, *Cannabin.* This latter contains a substance called *Cannabinol*, to which the activity of the drug is thought to be due; and the fact that cannabinol oxidises and loses its potency on exposure to the air would seem to explain why the drug deteriorates on keeping.

The preparations are:

1. The *Extract*—the drug is exhausted by percolating with alcohol (90 per cent.), and the product evaporated to a soft extract. Dose, $\frac{1}{4}$ to 1 grain.

2. The *Tincture*—prepared by dissolving the extract in alcohol (90 per cent.). Strength, 1 (of extract) in 20; dose, 5 to 15 minims. The tincture is contained in compound tincture of chloroform and morphine.

Broom Tops.—The fresh and dried tops of *Cytisus scoparius* (Latin, *scopæ*, thin branches), the *Common Broom*, an indigenous shrub. Nat. Ord., Leguminosæ. Broom tops contain a volatile liquid alkaloid, *Sparteine*, which is a valuable diuretic and heart tonic. A substance named *Scoparin* has also been found, but is probably inert.

Medicinally, the drug acts as a safe diuretic, but in large doses causes vomiting and purging.

The preparations are:

(*a*) From the fresh tops:

1. The *Juice*—the expressed juice preserved by the addition of alcohol (90 per cent.). Dose, 1 to 2 fluid drachms.

(*b*) From the dried tops:

2. The *Infusion*—strength, 1 in 10; dose, 1 to 2 fluid ounces.

UNOFFICIAL.

Dulcamara.—The dried young stems and branches of the woody nightshade, or bitter-sweet, *Solanum Dulcamara* (Nat. Ord., Solanaceæ). It contains a glucoside, *dulcamarin*, which has the characteristic (first bitter, then sweet) taste of the drug and an alkaloid, *solanine*, which is also found in the potato-plant (*Solanum tuberosum*).

WHOLE PLANTS.

Chiretta.—The dried plant *Swertia chirata* (Nat. Ord., Gentianeæ), collected when in flower. A herb which grows in Northern India, and has long been used by the Hindus, the name "Chiretta" being derived from a Sanscrit word. Chiretta stems are about 3 feet long; they are of a brownish colour, and contain a large continuous pith. The drug is bitter but not astringent, and has been used as a hop substitute in brewing. It contains two bitter principles, *Ophelic Acid* and *Chiratin*. The latter is decomposed by boiling hydrochloric acid into *Ophelic Acid* and *Chiratogenin*.

The preparations are:

1. The *Infusion*—made with boiling water. Strength, 1 in 20; dose, ½ to 1 fluid ounce.

2. The *Concentrated Solution*—made by percolation with alcohol (20 per cent.). Strength, 1 in 2; dose, ½ to 1 fluid drachm.

3. The *Tincture*—made by percolation with alcohol (60 per cent.). Strength, 1 in 10; dose, ½ to 1 fluid drachm.

Lobelia—Indian Tobacco.—The dried flowering herb of *Lobelia inflata* (Nat. Ord., Lobeliaceæ). The name of the herb perpetuates that of L'Obel, a botanist, who lived in the reign of James I. and served that monarch. *Lobelia inflata* has distended or inflated capsules, which contain minute oblong reticulated (Latin, reticulum, a net, hence marked in a net-like manner) seeds. The stems are angular, channelled, winged, and hairy, the leaves irregularly toothed and hairy. The herb has a somewhat irritating odour and a burning, acrid taste, resembling that of tobacco. It is a native of North America, and was used by the Indians.

The drug is a powerful antispasmodic and expectorant, and has also diaphoretic and diuretic properties. It enters into the composition of smoking powders used for asthma. It is a dangerous poison in excessive doses, resembling tobacco in its action. It contains about 0·3 per cent. of a liquid alkaloid, *Lobeline*, also a volatile oil.

The official preparation is the *Ethereal Tincture*, which is made by percolation with spirit of ether (lobeline is readily soluble in ether). Strength, 1 in 5; dose, 5 to 15 minims.

Ergot—Syn.: Secale Cornutum (Horned Rye), Ergot of Rye.—The sclerotium (undeveloped stage) of a fungus, *Claviceps purpurea* (Class, Fungi), found in the ovary of rye, *Secale cereale* (Nat. Ord., Gramineæ). The drug comes chiefly from Spain, Russia, and Germany. Ergot consists of dark purple-brown grains about $\frac{1}{3}$ inch to $1\frac{1}{2}$ inches long, tapering towards the ends and generally curved. The drug has a peculiar odour and disagreeable taste.

Medicinally, ergot is an ecbolic (causing contraction of the uterine muscles); in small doses emmenagogue. It is also hæmostatic.

Ergot contains about 30 per cent. of a fixed oil, an alkaloid, *Ergotinine*, to which its ecbolic action is due, and which is present to the extent of about 0·2 per cent. in German and Russian ergot, and about 0·3 per cent. in Spanish, and *Sphacelinic acid*, to which its hæmostatic action is due. Dose, 20 to 60 grains.

The official preparations are:

1. The *Extract*, which is made by percolation with alcohol (60 per cent.). Syn.: *Ergotin*—dose, 2 to 8 grains. From this is prepared

2. *The Hypodermic Injection*—strength, 1 (of extract) in 3; dose, by subcutaneous injection, 3 to 10 minims.

3. The *Liquid Extract*. The drug is exhausted by water and preserved with alcohol (90 per cent.). Strength, 1 in 1; dose, 10 to 30 minims.

4. The *Infusion*—prepared by infusing the freshly-crushed drug in boiling water for fifteen minutes. Strength, 1 in 20; dose, 1 to 2 fluid ounces.

5. The *Ammoniated Tincture*. The powdered drug is percolated with alcohol (90 per cent.), to which has been added one-ninth of its volume of solution of ammonia. Strength, 1 in 4; dose, ½ to 1 fluid drachm.

UNOFFICIAL WHOLE PLANTS.

Lily of the Valley.—*Convallaria majalis* (Nat. Ord., Liliaceæ) has long been used in Russia for dropsy. It contains two glucosides, *Convallarin*, which has a purgative action, and *Convallamarin*, which is a heart tonic.

A tincture of lily of the valley is contained in the British Pharmaceutical Conference Formulary. It is made by macerating and percolating the dried powdered flowers and stalks in alcohol (60 per cent.). Strength, 1 in 8; dose, 5 to 20 minims.

Euphorbia.—*Euphorbia pilulifera* (so-called because it has small globular flower-heads), Nat. Ord., Euphorbiaceæ. A native of Australia. An extract, decoction, and tincture of the dried plant are used for asthma and bronchitis.

Grindelia.—The dried herbs *Grindelia squarrosa* and *Grindelia robusta* (Nat. Ord., Compositæ). Used in America for asthma and whooping-cough. An oleo-resin exudes on the flower-heads and leaves, to which the activity of the drug is thought to be due.

Savin Tops.—The tops, consisting of the young shoots and leaves, of *Juniperus sabina* (Nat. Ord., Coniferæ). A native of Southern Europe. Cultivated in this country. Savin has an emmenagogue action when given internally, but is dangerous in large doses. Used externally, it is rubefacient. The drug contains an essential oil.

Wild Lettuce. — The *Lactuca virosa* (Nat. Ord., Compositæ). The herb, which is a native of Central and Southern Europe, is found wild in England. The plant contains an abundance of milky juice; hence the generic name (from Latin, *lac*, *lactis*, milk).

The juice is collected and dried, and is then known as *Lactucarium*. It is slightly narcotic and diuretic. Dose, 2 to 10 grains.

Horehound. — The leaves and flowering tops of *Marrubium vulgare* (Nat. Ord., Labiatæ). Horehound has tonic, and in large doses laxative, properties, but is chiefly used as a domestic remedy for coughs, etc.

Rue.—The common Rue, *Ruta graveolens* (Latin, heavy smelling), Nat. Ord., Rutaceæ, is a native of Southern Europe, and is cultivated in this country.

The plant contains a volatile oil, which has stimulant and emmenagogue properties, and has been used criminally to produce abortion. Externally, it is rubefacient and vesicant. Dose, 1 to 4 minims.

CHAPTER V.

Flowers.

OFFICIAL.

Chamomile Flowers.—The dried expanded double or semi-double flower-heads of *Anthemis nobilis* (Greek, ἀνθέω, *antheō*, to blossom), Nat. Ord., Compositæ. Chamomile flowers are cultivated in this country, and are also imported from Belgium, France, and Germany. They have an aromatic odour, which is due to a volatile oil, which is present to the extent of nearly 1 per cent. The taste is bitter, the drug containing a bitter principle, and the flowers have been used as a hop substitute.

Medicinally, chamomiles are tonic and stomachic, and are useful in some forms of dyspepsia.

The preparations are :

1. The *Extract*—prepared by boiling the flowers with water, filtering and evaporating the product to a soft extract. As some of the essential oil is lost by this method of preparation, a little (15 minims to each pound of flowers) is added towards the end of the process. Strength, about 3 in 1 ; dose, 2 to 8 grains.

2. *Oil of Chamomile*. This is the essential oil already mentioned. Specific gravity, 0·905 to 0·915. This character is important, as it distinguishes the oil from

that of *Matricaria chamomilla*, which has a higher specific gravity. Dose, ½ to 3 minims.

Cloves.—The sun-dried flower-buds of *Eugenia caryophyllata* (the generic name is from that of Prince Eugene of Savoy, who was a great patron of botany; the specific from the Greek, *κάρυον*, *karyon*, a nut; and *φύλλον*, *phyllon*, a leaf), Nat. Ord., Myrtaceæ. The tree is a native of the Molucca Islands, but commercial supplies come from Zanzibar and Pemba (islands off the Eastern coast of Africa) and from the West Indies. Cloves have been used for many centuries, and as early as 200 B.C. Chinese State officials held the spice in their mouth before addressing their Sovereign, in order to perfume their breath.

Cloves contain from 15 to 18 per cent. of a volatile oil, which "they emit when indented with a finger-nail." Medicinally, they are stomachic, carminative, and stimulant. The volatile oil acts as a local anodyne, and is much used for toothache.

The preparations are:

1. *Oil of Cloves*—dose, 1 to 3 minims. Oil of cloves enters into the composition of compound pill of colocynth, and colocynth and henbane pill.
2. The *Infusion*—made by infusing bruised cloves in boiling water for fifteen minutes. Strength, 1 in 40; dose, ½ to 1 fluid ounce.

Bruised cloves also enter into the composition of compound infusion of orange, and the powdered spice into aromatic powder of chalk.

Saffron.—The dried stigmas and tops of the styles* of *Crocus sativus* (Greek, *κρόκη*, *krokē*, a thread), Nat. Ord., Irideæ.

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* The female portion of a flower consists of three parts: (*a*) The ovary, which contains the ovules, which need to be fertilized by pollen; (*b*) the style, or stalk, down which the pollen passes to the ovary; (*c*) the stigma, or top of the style, which receives the pollen.

Saffron as a medicine, condiment, perfume, or dye has been used for centuries, and, being expensive, has always been much adulterated. The penalties attached to our modern Food and Drugs Acts, stringent as they are, pale into insignificance before the enactments of the Middle Ages against saffron adulterators. Corporal and even capital punishment were then inflicted, and at least one guilty merchant was burnt, with his stock.

The trifid stigma of the *Crocus sativus* is very characteristic, and if saffron be placed in hot water most adulterants can easily be distinguished. Medicinally, saffron is probably inert, but it is used to colour some drugs and to mask the nauseous taste of others; whilst in Cornwall large quantities are employed in cake-making, the taste for the products having to be acquired by non-natives.

The official preparation is the *Tincture*, which is prepared by maceration in 60 per cent. alcohol. Strength, 1 in 20; dose, 5 to 15 minims.

Saffron is also used in making compound decoction of aloes, and compound tincture of cinchona.

Elder Flowers are the product of *Sambucus nigra* (so called because the ripe fruit is purplish-black), (Nat. Ord., Caprifoliaceæ), a native of this country. The flowers are small; they have a five-lobed gamopetalous (Greek, γαμέω, *gameo*, I marry; πεταλον, *petalon*, a petal, having the petals united at the base) corolla, with five stamens having yellow anthers.

Elder flowers contain a small proportion of volatile oil; they are used in preparing cosmetics and skin lotions.

The official preparation is *Elder-flower Water*, which is prepared by distilling the fresh or preserved flowers with water. Strength, 1 in 1.

Kousso (Lat., *cusso*).—The dried inflorescence of female flowers of *Brayera anthelmintica*, called after

Brayer, a French physician; the specific name referring to the worm-expelling properties of the drug (Nat. Ord., Rosaceæ). A tree which is cultivated in Abyssinia. The natives use the flowers, and Europeans a rough unstrained infusion, for the expulsion of tapeworms, the action being thought to be partly mechanical. The principal active ingredient of kousso is an amorphous substance called *Kosotoxin*.

Dose of the dried drug, $\frac{1}{4}$ to $\frac{1}{2}$ ounce.

Red-Poppy Petals (Lat., *Rhœados petala*).—The fresh petals of *Papaver Rhœas* (Nat. Ord., Papaveraceæ). The red poppy so abundant in our cornfields. Poppy petals contain little or no morphine, and are only used for colouring; the syrup, however, has feeble narcotic properties when administered to young children.

The official preparation is the *Syrup*—strength, 1 in $4\frac{1}{2}$ (by weight); dose, $\frac{1}{2}$ to 1 fluid drachm.

Red-Rose Petals.—The fresh and dried unexpanded petals of the Provins rose, *Rosa gallica* (Nat. Ord., Rosaceæ). The red rose is cultivated in this country and in France for medicinal purposes. The lighter-coloured petals are removed. Those that are used are of a deep purplish-red colour, passing into brownish-yellow towards the base. They have slight astringent properties, but are chiefly used for colouring.

The preparations are:

(*a*) From the fresh petals:

1. The *Confection.* The fresh petals are beaten in a stone mortar with three times their weight of sugar. Used for making pill masses.
2. The *Acid Infusion.* The fresh petals are infused in boiling water, acidulated by the addition of $1\frac{1}{4}$ per cent. dilute sulphuric acid, for a quarter of an hour (the sulphuric acid brings out the colour of the petals, and also gives the preparation most of

its tonic and astringent properties). Dose, ½ to 1 fluid ounce.

(*b*) From the dried petals :

3. The *Syrup*—dose, ½ to 1 fluid drachm.

UNOFFICIAL.

Cabbage-Rose Petals.—The petals of the *Rosa centifolia* (Nat. Ord., Rosaceæ). A native of the Caucasus, cultivated in this country.

Cabbage roses are not now used in medicine, but a syrup having mild laxative properties was formerly made from them.

Oil of Rose (Otto or Attar of Rose) and **Rose Water** are distilled from the fresh flowers of the *Rosa damascena.*

Arnica Flowers.—The flower-heads of *Arnica montana* (see p. 27). Preparations of arnica flowers have similar properties to those of the rhizome and roots, but are seldom used in this country.

Marigold or Calendula Flowers.—The dried florets of *Calendula officinalis*, the common marigold (Nat. Ord., Compositæ). The drug contains a tasteless substance called *Calendulin*, a bitter principle, and a volatile oil. It is used in the form of tincture (diluted) for bruises, etc.

Orange Flowers.—The fresh flowers of the bitter-orange tree (see p. 76). From these is prepared by distillation the orange-flower water of commerce, which diluted with twice its volume of water forms the official water (Aqua Aurantii Floris, P.B.).

Syrup of Orange Flower contains 1 part of undiluted orange-flower water in nine. Dose, ½ to 1 fluid drachm.

Pyrethrum Cinerarifolium.—Nat. Ord., Compositæ. A native of Dalmatia. The powdered, dried, closed flower heads are used as an insecticide. They contain a small quantity of volatile oil, also a toxic principle.

CHAPTER VI.

Fruits.

OFFICIAL.

Dill Fruit (Anethi fructus, P.B.).—The dried ripe fruit of *Peucedanum graveolens* (Nat. Ord., Umbelliferæ), a plant which is cultivated in England and Germany. The fruit is a *cremocarp* (Greek, κρημναω, *krēmnaō*, to hang down; καρπός, *karpos*, a fruit—a fruit which breaks up into two halves hanging upon a central stalk—*Edmonds*). The two mericarps (Greek, μερίς, *meris*, a part; καρπός, *karpos*, a fruit) are usually separate, and freed from the stalk. They have inconspicuous dorsal ridges, and prominent winged lateral ones.

Dill fruit contains about 3 per cent. of a volatile oil. Medicinally, it acts as a stimulant and carminative, and is much used for infants, the name having been traced to an old Norse word *dilla*, to lull. Ἄνηθον, *anēthon*, signifying dill fruit, is mentioned in the New Testament, but has been wrongly translated in English versions *Anise* (see Matt. xxiii. 23).

The preparations are:

1. *Oil of Dill*—dose, ½ to 3 minims.
2. *Dill Water*—prepared from the fruit by distillation with water.

Anise Fruit.—The dried ripe cremocarp of *Pim-*

pinella anisum (Nat. Ord., Umbelliferæ), a plant which is a native of Asia Minor and Egypt, but largely cultivated in the warmer parts of Europe. The mericarps are usually united and attached to the pedicle, and have short bristly hairs. The taste and odour are pleasant and aromatic.

Anise contains about 2 per cent. of a volatile oil, and has similar medicinal properties to those of dill.

The preparations are:

1. *Oil of Anise*—dose ½ to 3 minims. This oil may be and usually is obtained from the star anise, *Illicium verum* (Nat. Ord , Magnoliaceæ), a small tree which is a native of China, and bears fruits of a striking stellate appearance, which contain about 5 per cent. of a volatile oil identical with that obtained from the *Pimpinella anisum.*

From the oil is prepared spirit of anise, the strength of which is 1 in 10, and the dose 5 to 20 minims.

2. *Anise Water*—prepared from the fruit of the *Pimpinella anisum* by distillation with water.

Capsicum.—The dried ripe fruit of *Capsicum minimum* (Nat. Ord., Solanaceæ), a small shrub indigenous to Southern India, and cultivated there and in other tropical countries. *Capsicum Fruits*, or chillies, are scarlet in colour when fresh, drying to a dull orange-red. They have a characteristic odour and an intensely pungent taste. The powdered fruit is known as cayenne pepper.

Externally, the drug is used as a rubefacient; internally, it is powerfully stimulant and carminative.

Capsicum contains *Capsaicin*, to which the pungency is due. This substance is akin to, and probably isomeric with, gingerol and parodol (see pp. 33, 94), but differs from them in being crystalline.

The preparations are:

1. The *Tincture*—prepared by macerating the powdered

drug in alcohol (70 per cent.). Strength, 1 in 20; dose, 5 to 15 minims.

2. The *Ointment*—prepared by digesting the crushed fruit in melted spermaceti and olive oil. Strength, about 1 in 5.

Caraway Fruit.—The dried cremocarp of *Carum carvi* (Nat. Ord., Umbelliferæ). Indigenous to and cultivated in Central and Northern Europe. The mericarps are usually separate, and glabrous (Latin, smooth). In a transverse section of each mericarp will be found six vittæ (oil-glands).

The fruit contains about 5 per cent. of a volatile oil, and has similar medicinal properties to those of dill and anise.

The preparations are:

1. The *Oil*—dose, ½ to 3 minims.

2. The *Water*—prepared from the fruit by distillation with water.

The fruit is also used in making compound tincture of cardamoms, and compound tincture of senna; and the powdered fruit enters into the composition of confection of pepper, and compound powder of opium.

Hemlock Fruit.—The dried, full-grown, unripe fruits of the *Conium maculatum* (see p. 56). In the commercial drug the mericarps are usually separated; they are glabrous (differing thus from anise fruit). In transverse section the outline is reniform (kidney-shaped). Hemlock fruit has no marked odour or taste, but, when rubbed with solution of caustic potash the characteristic odour of *conine* is evolved.

The medicinal properties are similar to those of the leaves (see p. 56), but stronger, as the fruit contains more *conine*.

The official preparation is the *Tincture*, made by percolating the powdered fruit with alcohol (70 per cent.). Strength, 1 in 5; dose, ½ to 1 fluid drachm.

Coriander Fruit.—The dried, ripe, nearly globular cremocarp of the *Coriandrum sativum* (Nat. Ord., Umbelliferæ), a native of the countries around the Mediterranean, cultivated chiefly in Russia. Although coriander, as found in commerce, has a pleasant aroma, the unripe fruit has a most disagreeable odour; hence its name from the Greek *κόρις*, *koris*, a bug.

Coriander fruit contains about 0·5 to 1 per cent. of a volatile oil, and has similar medicinal properties to those of dill, anise, and caraway.

The official preparation is the *Oil of Coriander*—dose, ½ to 3 minims.

The fruit also enters into the composition of confection of senna, syrup of rhubarb, compound tincture of rhubarb, compound tincture of senna; and the oil into syrup of senna.

Fennel Fruit.—The dried ripe fruit of *Fœniculum capillaceum* (Latin, *fœnum*, hay; *capillus*, a hair, in reference to the thread-like leaves), Nat. Ord., Umbelliferæ. The plant is a native of the Mediterranean region, but is cultivated in France, Saxony, etc. The fruit, as found in commerce, is usually entire, but is readily separated into its two mericarps, each of which has five prominent ridges, and exhibits in transverse section six large vittæ.

The odour and taste are pleasant and characteristic, the fruit containing about 5 per cent. of a volatile oil, whilst the medicinal properties are similar to those of anise, dill, coriander, and caraway.

The preparation is *Fennel Water*—prepared from the fruit by distillation with water.

Powdered fennel fruit is one of the five ingredients which enter into the composition of compound liquorice powder.

Black Pepper.—The dried unripe fruit of *Piper* *nigrum* (Nat. Ord., Piperaceæ), a climbing plant which is a native of Southern India, but cultivated chiefly in Sumatra and Singapore. The fruit has no stalk, is covered by a dark, deeply-wrinkled pericarp, and contains one seed, which completely fills the pericarp (Greek, *περί*, *peri*, around; *καρπός*, *karpos*, fruit).

White pepper is produced by removing the dark outer layer of pericarp from the nearly-ripe fruit.

Both the pericarp and the seed contain a volatile oil, to which the characteristic odour is due; a crystalline alkaloid, *Piperine*, which is isomeric with morphine, and to which the pungent taste is largely due, and a resin.

Pepper used externally acts as an anodyne and counter-irritant; internally, it is stimulant, carminative, and diuretic.

The official preparation is the *Confection of Pepper*—strength, 1 in 10; dose, 60 to 120 grains.

Powdered black pepper is also contained in compound powder of opium.

It may be convenient to mention here the unofficial **Long Pepper**, which is the dried unripe fruit of *Piper officinarum*, a native of the Malay Archipelago. Long pepper is a spike (Latin, *spica*, an ear of corn) bearing numerous minute sessile fruits. Commercially, the dried unripe fruit is used; it is of a greyish-white colour, being covered with an earthy powder, which can be removed by washing. Long pepper has the same constituents as black pepper, but in smaller proportions. It is little used medicinally.

Pimento or **Allspice**.—The dried, full-grown, unripe fruit of *Pimenta officinalis* (Nat. Ord., Myrtaceæ), a tree which is indigenous to the West Indies, and cultivated particularly in Jamaica. The fruit is dark reddish-brown, nearly globular, and is internally divided into two cells, each of which contains one reniform seed.

The fruit contains about 3 to 4 per cent. of a volatile oil, which is similar in composition to oil of cloves. Medicinally, it is stomachic, stimulant, and carminative, but is chiefly used for flavouring.

The preparations are:

1. *Oil of Pimento*—dose, ½ to 3 minims.
2. *Pimento Water*—prepared from the bruised fruit by distillation with water.

Cassia Pulp.—The pulp obtained from the pods of *Cassia fistula* (Nat. Ord., Leguminosæ). The pods are from 18 to 24 inches long, very hard externally, and divided internally into cells, each of which contains a seed surrounded by pulp. Old pods containing dried pulp should not be used. Cassia pulp is a mild laxative, and enters into the composition of confection of senna.

Cubebs.—The dried, full-grown, unripe fruits of *Piper Cubeba*, a native of Java, Sumatra, and Borneo. The fruit is nearly globular and contains a single seed, which is attached to the pericarp by its base only. The stalk is longer than the globular part; hence cubebs are sometimes known as "tailed pepper."

The fruit contains a considerable amount of volatile oil (varying from 10 to 18 per cent.), a neutral substance, *Cubebin*, which has little medicinal action, *Cubebic Acid*, and a resin. Cubebic acid gives a crimson colour with sulphuric acid, as does the crushed fruit.

Medicinally, cubebs are expectorant and diuretic.

The preparations are:

1. *Oil of Cubebs*—dose, ½ to 3 minims.
2. The *Tincture*—made by percolating the powdered drug with alcohol (90 per cent.). Strength, 1 in 5; dose, ½ to 1 fluid drachm.

Tamarinds.—The fruits of *Tamarindus indica* (Nat. Ord., Leguminosæ), freed from the outer part of the pericarp and preserved with sugar.

Tamarinds contain vegetable acids, chiefly tartaric and citric, also cream of tartar. Medicinally, they act as a mild laxative and refrigerant.

They are used in making *Confection of Senna.*

Prunes.—The dried ripe fruits of a variety of *Prunus domestica* (Nat. Ord., Rosaceæ).

Prunes contain a large amount of sugar and some vegetable acids. Taken freely as a food, they are useful for the constipation of children.

They are used in making *Confection of Senna.*

Figs (Ficus, P.B.).—The fig consists of the enlarged. hollow, succulent receptacle bearing numerous one-seeded fruits of *Ficus carica* (Nat. Ord., Urticaceæ). It is cultivated in most temperate countries, but can only be preserved in warm and dry climates.

Medicinally, the dried fruit is used as a mild laxative, and is a constituent of confection of senna.

Hops (Lupulus, Syn. : Humulus, P.B.).—The dried strobiles of the female plant of *Humulus Lupulus* (Nat. Ord., Urticaceæ), collected from cultivated plants.

Hops contain a volatile oil, to which their characteristic odour is due, and which gives them their sleep-producing properties, and a bitter principle, *Lupamaric Acid*, which is a tonic and promotes the appetite.

The preparations are:

1. The *Infusion*—made by infusing freshly-broken hops for fifteen minutes in boiling water. Strength, 1 in 20; dose, 1 to 2 fluid ounces.

2. The *Tincture*—prepared by macerating hops in alcohol (60 per cent.). Strength, 1 in 5; dose, ½ to 1 fluid drachm.

Lupulin. — A granular powder, consisting of minute glands obtained from hops.

Lupulin has the medicinal properties of hops, but is less astringent. Dose, 2 to 5 grains.

Orange-Peel (Aurantii Cortex Recens and Aurantii Cortex Siccatus, P.B.).—The fresh and dried outer part of the pericarp of the fruit of *Citrus aurantium*, var. *Bigaradia* (Nat. Ord., Rutaceæ). Bitter oranges are imported from Spain (Seville), the dried peel being sent also from Malta. The peel contains an essential oil and a bitter principle.

Orange-peel is a mild tonic, but is chiefly used for flavouring.

(1) From the fresh peel is made the *Tincture*, by maceration in alcohol (90 per cent.). Strength, 1 in 4; dose, ½ to 1 fluid drachm.

The tincture is used in making syrup of orange, aromatic syrup, and aromatic syrup of cascara.

(2) *Orange Wine*, which is prepared by the fermentation of a saccharine solution to which the fresh peel has been added. It should contain 10 to 12 per cent. by volume of ethylic alcohol, and should be free from salicylic acid.

Orange wine is used in making wine of iron citrate and quinine wine.

The dried peel is used in the preparation of the *Infusion of Orange* (strength, 1 in 20; dose, ½ to 1 fluid ounce), and the *Compound Infusion of Orange* (strength, 1 in 40; dose, ½ to 1 fluid ounce), and is an ingredient in compound infusion of gentian, compound spirit of horseradish, compound tincture of cinchona, and compound tincture of gentian.

Lemon-Peel.—The fresh outer part of the pericarp of the fruit of *Citrus medica*, var. *limonum* (Nat. Ord., Rutaceæ). The lemon-tree is cultivated in the countries surrounding the Mediterranean. It contains a volatile oil, and is chiefly used as a flavouring agent.

The preparations are:

1. *Oil or Essence of Lemon*, which is obtained by

scarifying the fresh peel, thus breaking the oil-vesicles and liberating the oil. Dose, ½ to 3 minims.

2. *Syrup of Lemon*, which contains also fresh lemon-juice (see below). Dose, ½ to 1 fluid drachm.

3. *Tincture of Lemon*, which is prepared by macerating the fresh peel with alcohol (90 per cent.). Strength, 1 in 4; dose ½ to 1 fluid drachm.

Fresh lemon-peel is also used in making compound infusion of orange and compound infusion of gentian.

The freshly-expressed juice of the lemon is also in the Pharmacopœia. It contains 7 to 9 per cent. citric acid.

Colocynth Pulp.—The dried pulp freed from the seed of the bitter apple, *Citrullus colocynthis* (Nat. Ord., Cucurbitaceæ). The plant is very widely distributed, being found in India, Ceylon, Arabia, Syria, North Africa, etc. The finest commercial variety is known as Turkey colocynth, and comes from the region of the Levant.

Colocynth pulp is very light and spongy; it is odourless, but intensely bitter. It contains a glucoside, *Colocynthin*, to which its activity is due, and as the seeds contain none, they are carefully excluded from the drug. Their absence is insured by the pulp yielding only traces of fixed oil, of which the seeds contain a considerable quantity, and yielding at least 9 per cent. ash, the seeds yielding very little. (Note.—Genuine pulp sometimes yields not more than 7 per cent. ash.)

Medicinally, colocynth is a drastic purgative. It is usually given in combination with aloes and scammony, seldom alone. It is dangerous in large doses.

The preparations are:

1. The *Compound Extract of Colocynth*—dose, 2 to 8 grains.

2. The *Compound Colocynth Pill*—dose, 4 to 8 grains.

3. The *Pill of Colocynth and Hyoscyamus*—dose, 4 to 8 grains.

Poppy Capsules.—The nearly ripe dried fruit of *Papaver somniferum* (Nat. Ord., Papaveraceæ). A native of Asia Minor, but cultivated in this country for medicinal purposes. Poppy capsules are usually from 2 to 3 inches in diameter, are contracted below into a neck marked with the scars of the sepals and petals, and are crowned with the remains of the stellately-arranged sessile stigmas. They contain numerous small reniform seeds, which vary in colour from whitish to slate colour, and are marked reticulately. The capsules contain a very small amount of morphine and other opium alkaloids, but the seeds are free from these.

Poppy capsules possess in a slight degree the anodyne and narcotic properties of opium; they are used in the form of syrup, liquid extract, and decoction, but none of these preparations are official.

Opium.—The dried milky juice obtained by the incision of the unripe capsules of *Papaver somniferum.* The exuded juice is partially dried in the sun and then wrapped in poppy leaves. Opium comes chiefly from Turkey, but is also produced in Persia, India, and China.

Opium contains a large number of alkaloids, the chief of which are *Morphine*, *Codeine*, and *Narcotine.* The morphine exists in combination with meconic acid, and the detection of this acid is valuable evidence of the presence of opium in toxicological investigations.

Opium is valued chiefly by its morphine content, which varies from 4 to 20 per cent. It is officially enjoined, however, that opium for medicinal use, as such, must contain *when dried* between 9·5 and 10·5 per cent. of morphine, and when used for making tincture or extract not less than 7·5 per cent.

The strength is ascertained by the following method:

The drug is dried and powdered, and then triturated with slaked lime and water. By this means both the morphine and narcotine are set free from combination, but are dissolved in the solution of slaked lime. The solution is then filtered, a portion of the filtrate representing a definite weight of the opium taken, and rectified spirit, ether, and ammonium chloride added. The mixture is shaken and set aside. The ammonium chloride reacts with the slaked lime, with the formation of ammonium hydrate. This precipitates morphine and narcotine. The latter, however, is soluble in ether, and a separation is thus effected. The addition of rectified spirit is to dissolve out certain impurities, which otherwise would be found in the final precipitate. The precipitated morphine is collected on a filter-paper, and washed, first with ether and then with morphine-saturated water (morphinated water, B.P.). The washed crystals are dried and weighed, and the amount of pure morphine determined by titration with decinormal solution of sulphuric acid. To this amount an addition is made of 1 milligramme for every cubic centimetre of the original filtrate, as that represents approximately the morphine retained in solution.

Medicinally, opium is anodyne and narcotic. Dose, ½ to 2 grains.

The official preparations are :

1. The *Plaster*—made by stirring powdered opium into melted resin plaster. Strength, 1 in 10.

2. The *Extract*. Opium is repeatedly macerated in cold water, and the product evaporated to half the original weight of the drug. The extract is therefore twice as strong as the crude opium, and contains 20 per cent. morphine. Dose, ¼ to 1 grain. From the extract is prepared :

3. The *Liquid Extract*. The extract is dissolved in a mixture of 3 fluid parts of water and 1 fluid part rectified

spirit. Strength, 0·75 per cent. morphine; dose, 5 to 30 minims.

4. *Tincture* (Syn.: *Laudanum*). This is prepared by macerating the drug for six hours with hot water, adding an equal quantity of rectified spirit, and again macerating for two periods of twenty-four hours. The morphine in the resulting product is estimated by a process similar to that used for ascertaining the strength of the crude drug, and the strength adjusted so that the tincture shall contain 0·75 per cent. morphine. Dose, 5 to 15 minims for repeated administrations, 20 to 30 minims for a single dose.

From tincture of opium are prepared:

5. The *Liniment of Opium*, which is made by mixing equal parts of the tincture and soap liniment. Strength, 0·375 per cent. morphine.

6. The *Compound Tincture of Camphor* (Syn.: *Paregoric, Paregoric Elixir*). This contains, in addition to tincture of opium, benzoic acid, camphor, and oil of anise dissolved in alcohol (60 per cent.). Strength, about 0·046 per cent. morphine; dose, ½ to 1 fluid drachm.

7. The *Ammoniated Tincture of Opium* (*Scotch Paregoric*)—contains oil of anise and benzoic acid dissolved in rectified spirit, tincture of opium, and solution of ammonia. Strength, 0·11 per cent. morphine; dose, ½ to 1 fluid drachm.

Powdered opium is used for making:

1. The *Compound Powder of Opium*—strength of opium, 10 per cent.; dose, 2 to 10 grains.

2. The *Compound Powder of Ipecacuanha* (Syn.: *Dover's Powder*)—strength, 10 per cent. of opium and 10 per cent. of ipecacuanha (from this is made ipecacuanha and squill pill—strength, about 5 per cent. of opium and 5 per cent. of ipecacuanha; dose, 4 to 8 grains); dose, 5 to 15 grains.

3. The *Compound Powder of Kino*—strength, 5 per cent. of opium; dose, 5 to 15 grains.

4. The *Aromatic Powder of Chalk with Opium*—strength, $2\frac{1}{2}$ per cent. of opium; dose, 10 to 40 grains.

5. The *Pill of Lead with Opium*—strength, about 12·5 per cent. of opium, about 75 per cent. of lead acetate. Dose, 2 to 4 grains.

6. The *Compound Soap Pill*—strength, 20 per cent. of opium; dose, 2 to 4 grains.

7. *Compound Lead Suppositories.*—Each suppository contains 3 grains of lead acetate and 1 grain of powdered opium.

8. *Gall and Opium Ointment*—contains 7·5 per cent. opium.

The following alkaloids and alkaloidal salts obtained from opium are included in the Pharmacopœia:

1. *Codeine.*—A crystalline alkaloid, soluble 1 in 80 of water. It is a hypnotic and feeble narcotic. Dose, $\frac{1}{4}$ to 2 grains.

2. *Codeine Phosphate.*—This is more soluble than the pure alkaloid, dissolving in 4 parts of water. Dose, to 2 grains.

From it is prepared the *Syrup of Codeine.* Each fluid drachm contains $\frac{1}{4}$ grain of codeine phosphate. Dose, $\frac{1}{2}$ to 2 fluid drachms.

3. *Morphine.*—The alkaloid itself is very slightly soluble in water, and is only used for making morphinated water (see p. 79).

The medicinal properties of morphine and its salts resemble very closely those of opium.

4. *Morphine Acetate.*—Dose, $\frac{1}{8}$ to $\frac{1}{2}$ grain.

From this is prepared the *Solution of Morphine Acetate.* Strength, 1 per cent.; dose, 10 to 60 minims.

5. *Morphine Hydrochloride.*—Dose, $\frac{1}{8}$ to $\frac{1}{2}$ grain.

The preparations from this are :

(*a*) *Solution of Morphine Hydrochloride* — strength, 1 per cent. ; dose, 10 to 60 minims.

(*b*) *Morphine Suppositories*—each suppository contains $\frac{1}{4}$ grain morphine hydrochloride.

(*c*) *Compound Tincture of Chloroform and Morphine*—contains $\frac{1}{11}$ grain morphine hydrochloride in every 10 minims ; dose, 5 to 15 minims.

(*d*) *Morphine Lozenges*—each lozenge contains $\frac{1}{36}$ grain morphine hydrochloride.

(*e*) *Morphine and Ipecacuanha Lozenges*—each lozenge contains $\frac{1}{36}$ grain morphine hydrochloride and $\frac{1}{12}$ grain ipecacuanha.

6. *Morphine Tartrate.*—Dose, $\frac{1}{8}$ to $\frac{1}{2}$ grain.

The preparations from this are :

(*a*) *Hypodermic Injection of Morphine*—strength, 5 per cent. morphine tartrate ; dose, by subcutaneous injection, 2 to 5 minims.

(*b*) *Solution of Morphine Tartrate* — strength, 1 per cent. ; dose, 10 to 60 minims.

Apomorphine Hydrochloride. — Apomorphine (Greek, *ἀπό*, *apo*, from) is prepared by heating morphine hydrochloride or codeine hydrochloride in a hermetically-sealed tube with excess of hydrochloric acid. The hydrochloride is prepared by shaking an ethereal or chloroformic solution of the alkaloid (apomorphine) with a small quantity of concentrated hydrochloric acid.

It is a powerful emetic and expectorant. Dose, by hypodermic injection, $\frac{1}{20}$ to $\frac{1}{10}$ grain ; by the mouth, $\frac{1}{10}$ to $\frac{1}{4}$ grain.

From this is prepared the *Hypodermic Injection of Apomorphine*—strength, 1 per cent. ; dose, by subcutaneous injection, 5 to 10 minims.

Elaterium.—The sediment from the juice of the fruit of the squirting cucumber, *Ecballium elaterium* (Nat.

Ord., Cucurbitaceæ), a native of the Mediterranean region. Cultivated in England, but commercial supplies of the drug come chiefly from Malta. The fruits are collected before they are quite ripe, sliced, and pressed, as, when ripe, they burst and the juice is lost. The juice is allowed to stand, and the sediment is collected and dried.

Elaterium contains from 20 to 25 per cent. of a crystalline principle, *Elaterin.* Medicinally, the drug is a hydragogue cathartic. Dose, $\frac{1}{10}$ to $\frac{1}{2}$ grain.

Elaterin.—The active principle of elaterium. A most violent purgative. Dose, $\frac{1}{40}$ to $\frac{1}{10}$ grain.

From this is prepared the *Compound Powder of Elaterin*, which consists of elaterin diluted with milk-sugar. Strength, 1 in 40; dose, 1 to 4 grains.

Picrotoxin.—Picrotoxin (Greek, *πικρὸς*, *picros*, bitter; *τοξικὸν*, *toxicon*, poison) is a neutral principle obtained from the fruits of *Cocculus Indicus*—Botanical Name, *Anamirta paniculata* (Nat. Ord., Menispermaceæ).

Externally, picrotoxin is used for destroying lice. Given internally, it is an anhydrotic (checks perspiration). Dose, $\frac{1}{100}$ to $\frac{1}{25}$ grain.

UNOFFICIAL.

Bael Fruit.—The fruit of *Ægle Marmelos* (Nat. Ord., Rutaceæ). A native of India, where the tree is regarded as sacred by the Hindus. The fresh half-ripe fruit is used as a remedy for diarrhœa and dysentery.

The dried fruit was formerly official, but is probably of little value, and is not now included in the Pharmacopœia.

Cummin Fruits. — The dried fruits of *Cuminum cyminum* (Nat. Ord., Umbelliferæ). A native of the upper regions of the Nile, cultivated in Sicily, Malta, and India.

Cummin has been used for many centuries as a spice. It is used in making curry-powders and also in veterinary medicine. It contains an essential oil.

Laurel Berries—Bay Berries.—The ripe fruits of *Laurus nobilis* (Nat. Ord., Laurineæ). Cultivated in England.

The berries contain a large quantity of fat, which is known as expressed oil of laurel, and is used in veterinary medicine.

Pomegranate Fruit.—The fruit of the *Punica granatum* (see p. 25). The dried peel of the fruit was formerly used as an astringent, as it contains much tannin.

Vanilla.—The pods of *Vanilla planifolia* (Nat. Ord., Orchideæ), a native of Mexico, but cultivated in Mauritius, Java, etc.

Vanilla pods were formerly used in medicine, but are now valued only for their fragrant smell and pleasant flavour. They contain about 2 per cent. *Vanillin*, a crystalline substance, which is often seen deposited on the outside of the preserved pods. Vanillin is also found in other vegetable products, and is produced artificially.

CHAPTER VII.

Seeds, Hairs, Glands, etc.

Bitter Almond.—The ripe seed of *Prunus Amygdalus*, var. *amara* (Nat. Ord., Rosaceæ). Cultivated in the countries around the Mediterranean. Bitter almonds closely resemble sweet almonds, but are shorter and proportionately broader, have a bitter taste, and when made into an emulsion with water evolve the characteristic odour of prussic acid.

Bitter almonds contain between 40 and 50 per cent. of a *fixed oil*, which can be obtained from them by *pressure*. This oil should be carefully distinguished from the "Oleum Amygdalæ Persicæ" of commerce, which consists of peach or apricot kernel oils, or a mixture of both. It is still more important to distinguish the almond oil of the Pharmacopœia from the *Essential Oil of Bitter Almonds*, which is obtained from the residual cake left after the expression of the fixed oil from bitter almonds. This oil contains about 5 per cent. hydrocyanic acid, which is formed by the interaction of amygdalin and emulsin (see p. 45), and is therefore highly poisonous. Yet another commercial oil is the "Oleum Amygdalæ sine Acido Prussico," which, as its name implies, is the essential oil of bitter almonds from which the hydrocyanic acid has been removed.

Sweet Almond.—The ripe seed of *Prunus Amygdalus*, var. *dulcis*. Somewhat longer and narrower than the bitter almond. Taste pleasant, and no marked odour from an aqueous emulsion. The official description practically excludes all varieties but that known as the Jordan almond, which comes from Malaga.

Sweet almonds are demulcent, but are chiefly used as a vehicle for more potent drugs. They contain about 50 per cent. of the fixed oil already described.

The preparations are:

1. *Almond Oil* (also obtained from the bitter almonds).
2. *Compound Powder of Almonds*, which contains also sugar and powdered gum acacia, and from which is made *almond mixture*, which is an emulsion produced by triturating the compound powder with water.

Cardamom Seeds.—The dried nearly ripe seeds of *Elettaria cardamomum* (Nat. Ord., Scitamineæ). A native of India, cultivated in that country and in Ceylon. Although only the seeds are used in medicine, it is officially ordered that the whole fruits should be obtained, and the seeds separated when required for use. This is to prevent the admixture of the seeds of the wild or Ceylon cardamom, the fruit of which is much larger, but the seeds of which can only be distinguished from the official variety by means of the microscope.

Cardamom seeds are stomachic and carminative, but are chiefly used as a flavouring.

The preparation is the *Compound Tincture of Cardamoms*. Strength of cardamoms, 1 in 80; dose, ½ to 1 fluid drachm.

They are used in making compound tincture of cardamoms, compound tincture of gentian, compound tincture of rhubarb, compound extract of colocynth, compound powder of cinnamon, and aromatic chalk powder.

Colchicum Seeds.—The dried ripe seeds of the meadow saffron (see p. 36). The seeds have a bitter taste, but no odour. They contain rather more of the alkaloid colchicine than does the corm (see p. 36).

The official preparation is the *Tincture*, which is prepared by percolating the powdered seeds with alcohol (45 per cent.). Strength, 1 in 5; dose, 5 to 15 minims.

Calabar Bean.—The ripe seeds of *Physostigma venenosum* (Nat. Ord., Leguminosæ). A native of Western Africa, where it grows near the Calabar River. The seeds, being used by the natives as a test of the guilt of criminals, are sometimes called "ordeal beans." They are reddish-brown in colour, oblong reniform in shape, and about 1 inch in length. They have the curious property of floating in water, this being due to a cavity between the cotyledons. The seeds contain about 0·25 per cent. of the alkaloid *Physostigmine*, or *Eserine*, to which the poisonous properties of the bean are largely due, and to which it owes its myotic (contracts the pupil of the eye) power.

The preparations are:

1. The *Extract*, made by exhausting the powdered drug by maceration and percolation with rectified spirit, evaporating the product to a soft consistence, and mixing the resulting extract with three times its weight of milk-sugar. Dose, $\frac{1}{4}$ to 1 grain.

2. *Physostigmine or Eserine Sulphate*—dose, $\frac{1}{60}$ to $\frac{1}{20}$ grain.

From this are prepared *Discs of Physostigmine* (*Lamellæ Physostigminæ*, P.B.), tiny gelatine discs for ophthalmic use, each weighing about $\frac{1}{50}$ grain, and containing $\frac{1}{1000}$ grain physostigmine sulphate.

White Mustard Seeds.—The dried ripe seeds of *Brassica alba* (Nat. Ord., Cruciferæ). Cultivated in this country and on the Continent of Europe. Small seeds of a pale-yellow colour, finely pitted and reticulated. The seeds even when powdered are inodorous, and almost so when triturated with water. The taste is less pungent than that of black mustard seeds.

Black Mustard Seeds. — The dried ripe seeds of *Brassica nigra*. The seeds are smaller than those of the white mustard. Brown in colour. Taste extremely pungent, and when triturated with water they yield a strong pungent odour.

White mustard seed contains a glucoside, *Sinalbin*, also a ferment, *Myrosin*, which is allied to emulsin (see p. 45). Black mustard seed contains *Sinigrin* and some myrosin. Both sinalbin and sinigrin are decomposed in the presence of water by myrosin, the pungent volatile oil of mustard being produced. Black mustard, however, contains an excess of sinigrin, white mustard an excess of ferment. The most pungent mustard is therefore a mixture of the two.

Mustard of the British Pharmacopœia (**Sinapis,** P.B.) is described as the dried ripe seeds of *Brassica nigra* and *B. alba*, powdered and mixed.

The official preparation is *Mustard Paper*, which is prepared by percolating the bruised seeds with benzol to remove the fixed oil, reducing the residue to powder, mixing it with solution of indiarubber, and spreading the mixture on paper.

Expressed Mustard Oil (unofficial) can be obtained from both the black and white seeds.

Volatile Oil of Mustard (*Oleum Sinapis Volatile*, P.B.) is prepared by distilling *black* mustard seeds which have been previously soaked in water. (The pungent principle of white mustard is not volatile.)

The volatile oil is used in making the liniment of mustard.

Linseed (Linum, P.B.).—The dried ripe seeds of the flax plant, *Linum usitatissimum* (Nat. Ord., Lineæ). Found in all temperate and tropical climates, cultivated largely in Russia.

Linseed contains between 30 and 40 per cent. of fixed oil, also much mucilage. It has demulcent and nutrient properties, but is chiefly used externally.

The official preparations are:

1. *Linseed Oil.*

2. *Crushed Linseed.* This must contain at least 30 per cent. oil and should yield not more than 5 per cent. ash (absence of excess of husk).

Nutmeg.—The dried seed of *Myristiceæ fragrans* deprived of its outer coat (*testa*), Nat. Ord., Myristiceæ. A native of the Molucca Islands, but chiefly imported from the Malay Archipelago.

Nutmegs contain about 40 per cent. of fat, which is known as expressed oil of nutmegs, and about 10 per cent. of a volatile oil.

Medicinally, nutmegs are carminative, and in large doses narcotic.

The official preparations are (1) the *Oil of Nutmeg*, prepared by distillation. Dose, ½ to 3 minims.

From this is prepared (2) *Spirit of Nutmeg*, which is a 10 per cent. solution of the oil in rectified spirit.

The oil also enters into the composition of aromatic spirit of ammonia and socotrine aloes pills, whilst the powdered fruit is used in making compound powder of catechu and aromatic powder of chalk, and the crushed fruit in compound spirit of horseradish and compound tincture of lavender.

Nux Vomica.—The dried ripe seeds of *Strychnos Nux-vomica* (Nat. Ord., Loganiaceæ). Indigenous to the East Indies.

Nux vomica seeds are small discs, slightly concave on one side and convex on the other. They are very hard, and are covered with short satiny hairs. The taste is very bitter. They contain two alkaloids, *Strychnine* and *Brucine*. These have similar physiological properties, but strychnine is much the stronger, and nux vomica and its preparations are valued by their strychnine content. The amount of strychnine in the seeds varies considerably, but averages about 1 per cent.

Medicinally, nux vomica is a valuable tonic. Dose, 1 to 4 grains.

The galenical preparations of the drug are:

1. The *Liquid Extract*—made by exhausting the powdered seeds by repeated percolation with alcohol (70 per cent.). The amount of strychnine in the product is then estimated, and the strength adjusted so that the finished liquid extract shall contain 1·5 per cent. strychnine.

The method of assay is, briefly, as follows: 5 c.c. of the liquid extract is evaporated to low bulk to remove the alcohol, and the residue dissolved in water. To this solution is added a solution of sodium carbonate to precipitate the alkaloids strychnine and brucine; chloroform is also added, to dissolve the alkaloids as they are thrown out of combination. The chloroformic solution of alkaloids is separated and shaken repeatedly with dilute sulphuric acid. The resulting solution of alkaloidal sulphates is mixed with a solution of potassium ferrocyanide, shaken well, and allowed to stand for six hours. By this means the alkaloids are precipitatedas ferrocyanides. The mixed ferrocyanides are collected on a filter-paper and washed with 200 c.c. water at 38° C., brucine ferrocyanide being soluble in water, whilst strychnine ferrocyanide is almost insoluble. The washed precipitate of strychnine ferrocyanide is transferred to a separator, and solution of ammonia and chloroform added. The former throws the alkaloid out of combination, and the latter dissolves it. By separating we obtain a chloroformic solution of strychnine. The chloroform is evaporated to dryness, a little amylic alcohol being added towards the end of the process to prevent decrepitation, and the strychnine weighed. To the weight must be added 0·01 gramme, to compensate for strychnine dissolved in the mother-liquor and wash-water. This process is the official one, modified in the light of the researches of Bird, Farr, Wright, and others.

From the liquid extract are made:

(*a*) The *Solid Extract*, by evaporation and admixture with milk-sugar. Strength, 5 per cent. strychnine; dose, $\frac{1}{4}$ to 1 grain.

(*b*) The *Tincture*, by mixing the liquid extract with water and rectified spirit. Strength, 0·25 per cent. strychnine; dose, 5 to 15 minims.

Strychnine.—A very potent alkaloid. Very sparingly soluble in water. In small doses acts as a valuable tonic, but is cumulative in its action, and thus even small doses if long continued may produce toxic effects.

Preparation: *Syrup of Phosphate of Iron with Quinine and Strychnine* (Easton's Syrup). Strength of strychnine about 1 in 2,000.

Strychnine Hydrochloride.—More soluble in water than the alkaloid. Dose $\frac{1}{60}$ to $\frac{1}{15}$ grain.

Preparation: *Solution of Strychnine Hydrochloride.* Strength, 1 per cent.; dose, 2 to 8 minims.

Ignatius Beans.—The seeds of *Strychnos ignatii* (Nat. Ord., Loganiaceæ), a native of the Philippine Islands, where the seeds were used as a medicine, and were introduced into Europe by Jesuit missionaries, who named the tree after their founder, Ignatius Loyola. The seeds are irregularly oblong in shape, and about an inch in length, but in structure they resemble nux vomica seeds. They contain about 3 per cent. of the alkaloids, *Strychnine* and *Brucine*, strychnine being present in the larger proportion.

Medicinally, they have the same properties as nux vomica, but are more potent.

Strophanthus Seeds.—The dried ripe seeds of *Strophanthus kombé* (Nat. Ord., Apocynaceæ), a native of Eastern Tropical Africa, where an extract was used as an arrow poison. The Africans, not unnaturally, were unwilling to give away the secrets of their armaments, but the source of their arrow poison was discovered by Sir John Kirk in 1861. "I had long sought for it," he wrote, "but the natives invariably gave me some false plant, until one day, at Chitisai village, on the river Shire, I saw the kombé, then new to me as an African plant (I had known an allied or, perhaps, identical species at Sierra Leone [1858], where it is used as a poison). There, climbing on a tall tree, it was in pod, and I could get no one to go up and pick specimens. On mounting the tree myself to reach the kombé pods, the natives, afraid that I might poison myself if I handled the plant roughly, or got the juice in a cut or in my mouth, warned me to be careful, and admitted that this was the Kombé, or poison-plant. In this way the poison was identified, and I brought specimens home to Kew, where they were described."

A considerable demand having sprung up for the drug, which is valuable as a heart tonic and diuretic, many spurious seeds have been imported, and it is difficult to discriminate between them and the genuine variety. The genuine seeds are of a greenish-fawn colour, and are covered with silky hairs. They have attached to them an awn or tuft of feathery hairs, which must, however, be removed before the drug is used, and which is generally absent from commercial specimens. On making a transverse section, and applying sulphuric acid (strength, 80 per cent., *Holmes*) the endosperm and sometimes the cotyledons are coloured green. This coloration is due to the presence of a glucoside, *Strophanthin.*

The official preparations are:

1. The *Extract.* The powdered seeds are freed from fat by percolation with ether, and subsequently exhausted with rectified spirit. The product is concentrated and thickened with milk-sugar. Strength, 1 in 2; dose, $\frac{1}{4}$ to 1 grain.

2. The *Tincture*—prepared by percolating the powdered seeds with alcohol (70 per cent.). Strength, 1 in 40; dose, 5 to 15 minims.

Stavesacre Seeds.—The dried ripe seeds of *Delphinium Staphisagria* (Nat. Ord., Ranunculaceæ). Indigenous to Asia Minor and Southern Europe. Cultivated in France and Italy. The seeds are irregularly triangular or quadrangular, wrinkled and pitted. They have no marked odour, but a nauseous, bitter taste.

Stavesacre seeds contain several alkaloids, the principal of which are *Delphine* (or *Delphinine*) and *Delphinoidine;* also about 25 per cent. of a fixed oil. Both the seeds and the expressed oil (which retains much alkaloid) act as parasiticides.

The official preparation is *Stavesacre Ointment*—strength, about 1 in 5.

Stramonium Seeds.—The dried ripe seeds of *Datura Stramonium* (see p. 55). The seeds are reniform in shape, reticulated, and pitted. They contain about 0·35 per cent. alkaloids, and have similar properties to those of the leaves.

The official preparation is the *Extract,* prepared by percolation with alcohol (70 per cent.). Dose, $\frac{1}{4}$ to 1 grain.

UNOFFICIAL SEEDS.

Areca Nuts.—The seeds of *Areca Catechu* (Nat. Ord., Palmeæ). A palm-tree cultivated in the East Indies.

The nuts contain the alkaloid *Arecoline* and much tannin. The powdered nuts are used for dental preparations and as a vermifuge in veterinary practice.

Tonquin or Tonka Beans.—The seeds of *Dipteryx odorata* and *D. oppositifolia* (Nat. Ord., Leguminosæ).

They contain a crystalline substance, *Coumarin*, which is also prepared artificially.

Barley.—The seeds of *Hordeum vulgare* (Nat. Ord., Gramineæ).

Barley is little used in medicine, except in the manufacture of extract of malt.

Henbane Seeds.—The seeds of *Hyoscyamus niger* (see p. 52).

Guarana.—A dried paste prepared from the powdered seeds of *Paullinia sorbilis* (Nat. Ord., Sapindaceæ). A native of Brazil.

Guarana contains from 2·5 to 5 per cent. caffeine, and is therefore a nerve stimulant similar to tea and coffee.

Quince Seeds.—The seeds of *Pyrus Cydonia* (Nat. Ord., Rosaceæ).

The seeds contain much mucilage, and have been used as a demulcent.

Grains of Paradise.—The seeds of *Amomum melegueta* (Nat. Ord., Scitamineæ).

The seeds, which have been used as a condiment, but are mostly employed as a veterinary stimulant, contain an essential oil and a pungent principle, *Paradol*, which is thought to be isomeric with gingerol and capsaicin.

Cocoa Seeds.—The seeds of *Theobroma Cacao* (Nat. Ord., Sterculiaceæ). Cultivated in tropical countries.

Cocoa seeds are nutritious, and are used for making the beverage cocoa and chocolate. They contain about 1 to 2 per cent. of an alkaloid, *Theobromine* (dimethylxanthine), which is closely allied to *Caffeine* (trimethylxanthine). They also contain about 50 per cent. of fat (oleum theobromæ, P.B.).

Fœnugreek or Fenugreek Seeds.—The seeds of *Trigonella Fœnum græcum* (Nat. Ord., Leguminosæ).

They are used in making curry-powders, also cattle foods and veterinary medicines. They contain two alkaloids, *Trigonethine*, and an alkaloid identical with choline. Choline was originally found in bile; hence its name, from the Greek, χολὴ, *cholē*, bile.

HAIRS, GLANDS, ETC.

Cotton-wool, Cotton (Gossypium, P.B.).—The hairs of the seed of *Gossypium barbadense* (Nat. Ord., Malvaceæ) and of other species of gossypium, freed from fatty matter. Cotton-wool is nearly pure cellulose, $C_6H_{10}O_5$.

It is used for making *Pyroxylin*. This is prepared by treating cotton-wool with a mixture of sulphuric acid and nitric acid. Dinitro-cellulose, $C_6H_8O_3(NO_3)_2$, is formed.

From this are prepared:

(*a*) *Collodion*, which is a solution of pyroxylin in a mixture of ether and alcohol, and from which is prepared, by mixing it with a small quantity of Canada turpentine and castor oil, *Flexible Collodion*.

(*b*) *Blistering Collodion*, which consists of blistering liquid in which 2½ per cent. pyroxylin has been dissolved.

Kamala.—A granular powder, consisting of the minute glands and hairs of the fruit of *Mallotus philippinensis* (Nat. Ord., Euphorbiaceæ).

The drug has cathartic and anthelmintic properties.

Cowhage.—The hairs of the pods of *Mucuna pruriens* (Nat. Ord., Leguminosæ).

Used as an anthelmintic.

CHAPTER VIII.

Plant Products.

Barbados or Curacao Aloes.—The juice from the leaves of *Aloe vera*, *Aloe chinensis* (Nat. Ord., Liliaceæ), and probably other species, evaporated to dryness. Imported from the West Indies.

Socotrine or Zanzibar Aloes.—The juice from the leaves of *Aloe Perryi*, and probably other species. Imported by way of Bombay.

Barbados and Socotrine Aloes can be distinguished by their characteristic odours, and by the powder of the former giving a crimson colour with nitric acid, whilst that of the latter gives a yellowish-brown.

Cape Aloes (unofficial).—The botanical source of this variety of aloes is not known.

Natal Aloes (unofficial).—This is said to be obtained from *Aloe ferox*, but its origin is doubtful.

Aloes contain crystalline principles called respectively *Barbaloin, Socaloin, Capaloin, and Nataloin,* according to the variety of aloes from which they are obtained. These differ slightly chemically, but are alike in their medicinal effects.

Aloes act as bitter tonics and cathartics.

The preparations are:

(*a*) From Barbados, or Socotrine aloes, *Aloin*—dose ½ to 2 grains.

(*b*) From Barbados aloes, *Extract of Barbados Aloes*—prepared by exhausting the drug with water. Dose, 1 to 4 grains.

This enters into the composition of—

(1) *Compound Decoction of Aloes*—dose, ½ to 2 fluid ounces.

(2) *Tincture of Aloes*—dose, ½ to 1 fluid drachm for repeated administration; 1½ to 2 fluid drachms for a single dose.

The powdered drug is used in making *Pill of Barbados Aloes* and *Pill of Aloes and Iron*, and enters into *Compound Pill of Colocynth*, *Pill of Colocynth and Hyoscyamus* and *Compound Extract of Colocynth.*

(*c*) From Socotrine aloes are made *Pill of Socotrine Aloes*, *Pill of Aloes and Asafœtida*, *Pill of Aloes and Myrrh.* It enters into the composition of *Compound Rhubarb Pill* and *Compound Tincture of Benzoin.*

Indiarubber (Caoutchouc, P.B.)—Pure Para rubber. The prepared milk-juice of *Hevea braziliensis.* A native of Brazil (Nat. Ord., Euphorbiaceæ). Insoluble in water or alcohol; soluble in chloroform, benzol, and carbon bisulphide.

The preparation is the *Solution of Indiarubber.* A solution of the shredded rubber in a mixture of benzol and carbon bisulphide. Used in making mustard-paper (see p. 88).

Gutta-percha (*unofficial*).—The dried purified milk-juice or "drops" of the "percha" trees; *Palaquium oblongifolium, P. borneense, P. Leerii,* and *P. Treubii* (Nat. Ord., Sapotaceæ).

Kino.—The dried juice from the trunk of *Pterocarpus Marsupium* (Nat. Ord., Leguminosæ). A tree which grows in Southern India and Ceylon.

The drug is astringent, as it contains a large amount of a variety of tannic acid, called *Kinotannic Acid.*

The preparations are :

1. *Compound Catechu Powder*—strength, 1 (of kino) in 5 ; dose, 10 to 40 grains.

2. *Compound Kino Powder*—strength, 3 (of kino) in 4 : contains also 5 per cent. of opium ; dose, 5 to 20 grains.

3. *Tincture of Kino*—strength, 1 in 10 ; dose, ½ to 1 fluid drachm.

This preparation gelatinizes owing to the presence of an enzyme.

A method of making the tincture, in which the kino is first boiled in water to destroy the enzyme, has been devised by Edmund White (see *Pharm. Journ.*, Nov. 14, 1903, p. 702).

Gum Acacia.—A gummy exudation from the stem and branches of *Acacia Senegal* (Nat. Ord., Leguminosæ). Collected in Eastern and Western Africa. Formerly brought from Arabia — hence called "gum arabic." Soluble in water, but insoluble in rectified spirit.

Gum Acacia consists chiefly of potassium, calcium, and magnesium salts of arabic and probably other organic acids.

Medicinally, it is emulcent, but it is used chiefly as a vehicle for suspending other drugs.

The preparation is the *Mucilage*—a solution of the gum in water. Two fluid parts of mucilage equal about one part of gum.

The powdered gum is used also in making iron pills, compound almond powder, compound tragacanth powder, and all the lozenges.

Tragacanth. — A gummy exudation obtained from *Astragalus gummifer* (Nat. Ord., Leguminosæ) and some other species of astragalus. Known in commerce as Syrian tragacanth.

> "Judæa's gum-tragacanth
> Scales off in purer flakes, shines clearer-grained,
> Cracks 'twixt the pestle and the porphyry—
> In fine, exceeds our produce."
> ROBERT BROWNING.

The gum is collected, however, in Persia. Sparingly soluble in water, being a mixture of a soluble arabinoid gum and an insoluble gum called *Basscrin.*

Medicinally, tragacanth is demulcent, but it is chiefly used to suspend heavy powders.

The preparations are *Glycerin of Tragacanth, Mucilage of Tragacanth, Compound Powder of Tragacanth.*

Eucalyptus Gum, Red Gum.—An exudation from the bark of *Eucalyptus rostrata* and other species (Nat. Ord., Myrtaceæ). Imported from Australia.

Red gum contains nearly 50 per cent. kinotannic acid, and is very astringent. Dose, 2 to 5 grains.

From it are prepared *Eucalyptus Gum Lozenges.* Each lozenge contains 1 grain of red gum.

Colophony (Resin, P.B.), Rosin.—The residue left after the distillation of the oil of turpentine from the oleo-resin (crude turpentine) that exudes from various species of *Pinus* (Nat. Ord., Coniferæ).

Used in the preparation of plasters and of resin ointment.

Asafetida.—A gum-resin obtained by incision from the root of *Ferula fœtida,* and probably other species (Nat. Ord., Umbelliferæ). Collected in Persia and Afghanistan. In tears, which, on breaking, expose a white surface, which gradually becomes pink. Asafetida is often adulterated with stony and earthy matter; the official tests, therefore, require that at least 65 per cent. of the drug should be soluble in rectified spirit, and that, on incineration, it should not yield more than 10 per cent. ash. Asafetida has a bitter, nauseous taste, and a strong, disagreeable, onion-like odour.

Medicinally, the drug is a stimulating expectorant, and mild laxative. It is particularly useful for cases of hysteria and malingering. Dose, 5 to 15 grains.

The preparations are the *Pill of Aloes and Asafetida*, *Compound Pill of Galbanum* (Syn.: *Compound Pill of Asafetida*), *Fetid Spirit of Ammonia*, *Tincture of Asafetida* (strength, 1 in 5; dose, ½ to 1 fluid drachm).

Ammoniacum.—A gum-resin exuded from the flowering and fruiting stem of *Dorema ammoniacum*, and probably other species (Nat. Ord., Umbelliferæ). Collected in Persia. In small tears, which form a white emulsion when triturated with water. Slight characteristic but not alliaceous odour; bitter taste.

Medicinally, the drug acts as a stimulating expectorant. Dose, 5 to 15 grains.

The preparations are *Ammoniacum and Mercury Plaster*, *Ammoniacum Mixture* (an emulsion), *Ipecacuanha and Squill Pill*, *Compound Squill Pill*.

Galbanum.—A gum-resin obtained from *Ferula galbaniflua*, and probably other species (Nat. Ord., Umbelliferæ). Imported from Persia and the Levant.

The medicinal properties of galbanum are similar to those of asafetida, but the drug is less active. Dose, 5 to 15 grains.

The preparation is the *Compound Pill of Galbanum*.

Gamboge.—A gum-resin obtained from *Garcinia Hanburii* (Nat. Ord., Guttiferæ), a tree which grows in Cambodia, Siam, and Cochin China. The gum-resin is collected in hollow bamboos, in which it is allowed to solidify. It therefore comes into commerce in rolls.

Medicinally, gamboge is a hydragogue cathartic, and in small doses diuretic. Dose, ½ to 2 grains.

The preparation is the *Compound Gamboge Pill*.

Myrrh.—A gum-resin obtained from the stem of *Balsamodendron myrrha* (Nat. Ord., Burseraceæ). Collected in North-Eastern Africa and Arabia. Myrrh should be soluble to the extent of 70 per cent. in rectified spirit, and should not yield more than 5 per cent. of ash.

Medicinally, it is expectorant and carminative.

The preparation is the *Tincture*—prepared by maceration in rectified spirit. Strength, 1 in 5; dose, ½ to 1 fluid drachm.

Myrrh is also used in making compound decoction of aloes, compound iron mixture, aloes and myrrh pills, compound galbanum pills, and compound rhubarb pills.

Copaiba, Copaiva.—The oleo-resin obtained from the trunk of *Copaifera Lansdorfii*, and other species (Nat. Ord., Leguminosæ). A native of South America. Copaiba should contain at least 40 per cent. volatile oil—the oil of copaiba of the Pharmacopœia.

Medicinally, copaiba is stimulant, antiseptic, and diuretic. Dose, ½ to 1 fluid drachm; dose, of the oil, 5 to 20 minims.

Canada Balsam, Canada Turpentine (Terebintha Canadensis, P.B.).—The oleo-resin from *Abies balsamea* (Nat. Ord., Coniferæ), which grows in the United States and Canada.

Seldom given internally. Used in making flexible collodion.

Frankincense (Thus Americanum, P.B.).—The concrete oleo-resin scraped off the trunks of *Pinus palustris* and *Pinus tæda*. Collected in the United States.

From this is prepared *Pitch Plaster*. True frankincense is gum olibanum.

Burgundy Pitch.—A resinous exudation from the stem of the Norway spruce-fir, *Picea excelsa* (Nat. Ord., Coniferæ). The drug is collected chiefly in Finland, but was formerly imported from Burgundy. A spurious article is made with turpentine, resin, palm oil, etc., but can be easily distinguished from the genuine by its being imperfectly soluble in glacial acetic acid.

Medicinally, Burgundy pitch acts as a gentle rubefacient.

The preparation is *Pitch Plaster*.

Peruvian Balsam is a balsam* exuded from the trunk of *Myroxylon Pereiræ*, after the bark has been beaten and scorched. The tree is a native of Central America, and the drug owes its name to the fact that it was formerly exported by way of Peru.

The balsam consists of an oily portion, mixed with a resin and some free cinnamic acid. The oil contains benzyl benzoate, and benzyl cinnamate (cinnamein), these two compounds constituting between 60 and 70 per cent. of the drug.

Medicinally, the drug is a stimulant expectorant. Externally, it acts as a parasiticide, and is used to stimulate indolent ulcers. Dose, 5 to 15 minims.

Balsam of Tolu.—A balsam obtained by making incisions in the trunk of *Myroxylon Toluifera* (Nat. Ord., Leguminosæ). Imported from South America.

It contains benzyl benzoate and benzyl cinnamate, also free benzoic and cinnamic acids. Exhausted with carbon bisulphide, the resulting solution should yield a crystalline residue on evaporation.

The medicinal properties are similar to those of Peruvian balsam. Dose, 5 to 15 grains.

The preparations are:

1. *Syrup of Balsam of Tolu*—dose, ½ to 1 fluid drachm.
2. *Tincture of Balsam of Tolu*—strength, 1 in 10; dose, ½ to 1 fluid drachm.

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* Balsams are mixtures of oleo-resins with one or more aromatic acids generally benzoic or cinnamic acid.

Prepared Storax.—A balsam obtained from the trunk of *Liquidambar orientalis* (Nat. Ord., Hamamelideæ), a native of Asia Minor. The balsam is purified by solution in ethylic alcohol, filtration, and evaporation of the solvent.

Storax contains much free cinnamic acid, also benzoic acid, cinnamates, etc.

Its medicinal properties are similar to those of Peruvian balsam and balsam of Tolu.

It is used in making *Compound Tincture of Benzoin.*

Benzoin.—A balsamic resin obtained from *Styrax Benzoin* and perhaps other species (Nat. Ord., Styraceæ). Two commercial varieties are officially recognised, Siam benzoin and Sumatra benzoin. Siam benzoin contains benzoic acid, but no cinnamic acid ; Sumatra benzoin contains both benzoic and cinnamic acids. Benzoin is often contaminated with woody matter, which is harmless, but inert. For medicinal use, at least 90 per cent. of the drug should be soluble in rectified spirit.

Medicinally, benzoin is expectorant, and, applied externally, antiseptic, and styptic.

The preparations are :

1. *Benzoic Acid*, obtained by sublimation—dose, 5 to 15 grains.

2. *Benzoated Lard*—lard preserved by the addition of 3 per cent. powdered benzoin.

3. *Spermaceti Ointment.*

4. *Compound Tincture of Benzoin*, or *Friar's Balsam*, which contains also storax, balsam of Tolu and Socotrine aloes. Strength, 1 (of benzoin) in 10 ; dose, ½ to 1 fluid drachm.

Catechu, Pale Catechu, Gambier.—An extract of the leaves and young shoots of *Uncaria Gambier* (Nat. Ord., Rubiaceæ). A native of the Malay Archipelago, cultivated in Singapore and Sumatra. The drug is found in commerce in cubes. It contains *catechu-tannic acid* and *catechin*.

Medicinally, it is astringent. Dose, 5 to 15 grains.

The preparations are :

1. *Compound Powder of Catechu*, which contains also kino, rhatany root, cinnamon bark, and nutmeg. Strength (of catechu), 1 in 2½ ; dose, 10 to 40 grains.

2. *Tincture of Catechu* — prepared by macerating catechu and cinnamon bark with alcohol (60 per cent.). Strength, 1 in 5 ; dose, ½ to 1 fluid drachm.

3. *Catechu Lozenges.* Each lozenge contains 1 grain of catechu.

Black Catechu, Cutch (*unofficial*).—An extract prepared from the heart-wood of *Acacia Catechu* (Nat. Ord., Leguminosæ). Cutch has a similar chemical composition to that of gambier, but is chiefly used for dyeing and tanning.

Caffeine, Theine. — An alkaloid obtained from the dried leaves of the tea-plant, *Camellia theifera* (Nat. Ord., Ternströmiaceæ), or the dried berries from *Coffea arabica* (Nat. Ord., Rubiaceæ). Tea-leaves contain about 3 per cent. of the alkaloid, coffee berries about 1 per cent.

Caffeine is a heart tonic and diuretic. Dose, 1 to 5 grains.

The preparations are :

1. *Caffeine Citrate*—an unstable mixture of caffeine and citric acid, more soluble in water than the pure alkaloid. Dose, 2 to 10 grains.

2. *Effervescent Caffeine Citrate*—strength, 4 per cent. ; dose, 60 to 120 grains.

Veratrine.—An alkaloid, or mixture of alkaloids, prepared from cevadilla, the dried ripe seeds of *Schœnocaulon officinale* (Nat. Ord., Liliaceæ).

The preparation is *Veratrine Ointment*—strength, 1 in 50.

Salicin.—A crystalline glucoside obtained from the bark of various species of willow (*Salix*) and of poplar (*Populus*), Nat. Ord., Salicaceæ.

Medicinally, it is an antipyretic and tonic, being specially useful in acute rheumatism. Dose, 5 to 20 grains.

Santonin.—A crystalline principle prepared from *Santonica*, the dried unexpanded flower-heads (*capitula*) of wormwood, *Artemisia maritima*, var. *Stechmanniana* (Nat. Ord., Compositæ).

Medicinally, santonin acts as an anthelmintic. Dose, 2 to 5 grains.

From it are prepared *Santonin Lozenges*. Each lozenge contains 1 grain of the drug.

Camphor.—A stearopten obtained from the wood of *Cinnamomum camphora* (Nat. Ord., Laurineæ), a tree which is indigenous to Japan, Formosa, China, and Cochin China. The crude product is purified by sublimation in this country. Pure camphor sublimes without residue. It is almost insoluble in water (1 in 700), but soluble in rectified spirit, chloroform, olive oil, and ether. It forms a liquid when triturated with chloral hydrate, menthol, phenol, or thymol.

Medicinally, camphor is stimulant, sedative, and expectorant. Contrary to popular belief, it is but a feeble antiseptic. Dose, 2 to 5 grains.

The preparations are:

1. *Camphor Water*. The camphor is dissolved in rectified spirit, and the spirituous solution gradually added to water with constant agitation. Strength, 1 in 1,000.
2. *Liniment of Camphor, Camphorated Oil*—a solution of camphor in olive oil. Strength, 1 in 5.
3. *Ammoniated Liniment of Camphor, Compound Liniment of Camphor*—contains camphor, rectified spirit, oil

of lavender, and solution of ammonia. Strength (of camphor), 1 in 8.

4. *Spirit of Camphor*—a 10 per cent. solution of camphor in rectified spirit. Dose, 5 to 20 minims.

5. *Compound Tincture of Camphor, Paregoric, Paregoric Elixir.*—The chief active ingredient of this preparation, as already shown (p. 80), is opium. Dose, 5 to 15 minims.

Menthol.—A crystalline substance obtained by cooling the volatile oil from the fresh herb of *Mentha arvensis* (vars. *piperascens*, and *glabrata*) and *Mentha piperita* (Nat. Ord., Labiatæ). Commercial supplies come chiefly from China.

Menthol is very slightly soluble in water, but is soluble in rectified spirit. It should be entirely volatilized by the heat of a water-bath.

Medicinally, it is antiseptic, stimulant and carminative, and is also used externally as a local anæsthetic. Dose, ½ to 2 grains.

The preparation is *Menthol Plaster.*

Thymol.—A crystalline substance obtained from the volatile oils of *Thymus vulgaris* and *Monarda punctata* (Nat. Ord., Labiatæ), and from *Carum copticum* (Nat. Ord., Umbelliferæ).

Thymol is a powerful antiseptic. Dose, ½ to 2 grains.

Cane-Sugar (Refined Sugar, P.B.), Sucrose ($C_{12}H_{22}O_{11}$).—Obtained from the juice of the sugar-cane, *Saccharum officinarum* (Nat. Ord., Gramineæ). Used in preparing all the syrups. (Seven fluid parts of simple syrup equal about 6 parts sugar.)

Starch (Amylum, P.B.).—Produced from the grains of wheat, *Triticum sativum*, maize, *Zea Mays*, and rice, *Oryza sativa*, all of which belong to the Nat. Ord. Gramineæ.

Boiled with water, starch gives a deep-blue colour with solution of iodine. The different varieties of starch can be distinguished by their microscopic character.

Starch is nutritious and demulcent. It is used as an antidote in poisoning by iodine.

The preparations are *Glycerin of Starch* and *Compound Powder of Tragacanth.*

Goa Powder, Crude Chrysarobin (Araroba, P.B.).—A yellow or brown powder found in cavities in the trunk of *Andira araroba* (Nat. Ord., Leguminosæ), a tree which is a native of Brazil. It should yield to hot chloroform at least 50 per cent. of a substance answering to the characters of *Chrysarobin* (*Chrysarobinum*, P.B.). This consists chiefly of pure chrysarobin, but contains also some chrysophanic acid.

It is a parasiticide, and is used externally for skin diseases. Internally, it acts as a purgative, but must be given in very small doses.

The preparation is the *Ointment*—strength, 1 in 25.

Creosote.—A mixture of guaiacol, creosol, and other phenols; obtained in the distillation of wood-tar. (Phenols are hydroxyl derivatives of hydrocarbons, having the general formula $C_nH_{2n-7}OH$.)

Medicinally, creosote is disinfectant and antiseptic. Dose, 1 to 5 minims.

The preparations are:

1. *Creosote Mixture.* Each fluid ounce contains 1 minim of creosote and 1 minim of spirit of juniper. Dose, ½ to 1 fluid ounce.
2. *Creosote Ointment*—strength, 1 in 10.

Tar, Stockholm Tar (Pix Liquida, P.B.).—Obtained by destructive distillation from the wood of the Scotch fir, *Pinus sylvestris*, and other species.

Medicinally, tar acts as a disinfectant expectorant. Externally, it is used for skin diseases.

The preparation is *Tar Ointment* (*Unguentum Picis Liquidæ*, P.B.).

Galls are excrescences on *Quercus infectoria* (Nat. Ord., Cupuliferæ) resulting from the puncture of the bark of young twigs by the female insect *Cynips gallæ tinctoriæ*, and the deposition of eggs. The best (Aleppo) galls are collected before the insect escapes.

Galls contain between 60 and 70 per cent. tannic acid, also a little gallic acid.

Medicinally, they are astringent, and are used in the form of ointment for hæmorrhoids.

The preparations are:

1. *Gallic Acid*—dose, 5 to 15 grains.
2. *Tannic Acid*, *Gallotannic Acid*, *Tannin*—dose, 2 to 5 grains.
3. *Gall Ointment* and *Gall Ointment with Opium*.

CHAPTER IX.

Plant Products—(*continued*).

Croton Oil.—A fixed oil expressed from the seeds of *Croton tiglium* (Nat. Ord., Euphorbiaceæ). A native of Hindustan and Ceylon.

Medicinally, croton oil is a powerful drastic cathartic. Externally, it is used as a counter-irritant. Dose, ½ to 1 minim.

The preparation is *Croton Oil Liniment.*

Castor Oil (Oleum Ricini, P.B.).—The oil expressed from the seeds of *Ricinus communis* (Nat. Ord., Euphorbiaceæ). A native of India, but cultivated in many tropical and subtropical countries.

Medicinally, castor oil is a mild cathartic, especially suitable for children. Dose, 1 to 8 fluid drachms.

The preparation is *Castor Oil Mixture.* The oil is suspended by means of mucilage of gum acacia and the mixture flavoured with orange-flower water and cinnamon water. Strength, 3 in 8; dose, 1 to 2 fluid ounces as a draught.

Castor oil is also used in making compound calomel pill, mustard liniment, and flexible collodion.

Olive Oil.—The oil expressed from the ripe fruit of *Olea europea* (Nat. Ord., Oleaceæ). A native of Asia Minor, but long cultivated in Europe.

Olive oil is a laxative, and in small quantities nutritive.

Cade Oil, Juniper Tar Oil.—A tarry, oily liquid obtained by the destructive distillation of the wood of *Juniperus oxycedrus* (Nat. Order, Coniferæ) and some other species.

Medicinally, it is a stimulating application for certain skin diseases.

Cajuput Oil.—The oil distilled from the leaves of *Melaleuca Leucadendron* (Nat. Ord., Myrtaceæ).

Cajuput oil contains about 55 per cent. of cineol.

Medicinally, it is stimulant and antispasmodic. Dose, ½ to 3 minims.

The preparation is the *Spirit of Cajuput*—strength, 10 per cent.; dose, 5 to 20 minims.

It is also used in making croton oil liniment.

Eucalyptus Oil.—The oil distilled from the fresh leaves of *Eucalyptus Globulus* (Nat. Ord., Myrtaceæ) and other species. Most of the eucalyptus oil of commerce comes from Australasia. The oil should contain about 50 per cent. eucalyptol (which is identical with cineol), and should not contain much phellandrene.

Medicinally, it is antiseptic, antipyretic, and deodorising. Dose, ½ to 3 minims.

The preparation is *Eucalyptus Ointment*, 1 in 10.

Juniper Oil.—The oil distilled from the full-grown, unripe green fruit of *Juniperus communis* (Nat. Ord., Coniferæ). A native of this country.

Medicinally, a stimulant, diuretic, and carminative. Dose, ½ to 3 minims.

The preparation is the *Spirit of Juniper*—strength, 1 in 20; dose, 20 to 60 minims. Used in making Creosote Mixture (see p. 107).

Lavender Oil.—The oil distilled from the flowers of *Lavandula vera* (Nat. Ord., Labiatæ). Specific gravity not below 0·885.* Should dissolve in three times its volume of alcohol (70 per cent.).

Medicinally, lavender oil is an aromatic stimulant and carminative, but it is seldom given alone, and is chiefly used for flavouring. Dose, ½ to 3 minims.

The preparations are: (1) The *Spirit*—1 in 10; dose, 5 to 20 minims. (2) The *Compound Mixture of Lavender*—dose, ½ to 1 fluid drachm.

The oil is also contained in ammoniated liniment of camphor.

Peppermint Oil.—The oil distilled from the fresh flowering peppermint plant, *Mentha piperita* (Nat. Ord., Labiatæ). Specific gravity 0·900 to 0·920. Should dissolve in four times its volume of alcohol (70 per cent.). If a portion of the oil be cooled to 17° F., and a few crystals of menthol be added, a considerable separation of menthol should take place. (Only a redistilled American oil will answer these tests.)

Medicinally, peppermint oil is stimulant and carminative. Dose, ½ to 3 minims.

The preparations are: (1) *Peppermint Water*—strength, 1 in 1,000; prepared by distillation. (2) *Spirit of Peppermint*—strength, 1 in 10; dose, 5 to 20 minims.

Spearmint Oil, Oleum Menthæ Viridis, P.B.—The oil distilled from the fresh flowering herb, *Mentha viridis* (Nat. Ord., Labiatæ).

Medicinal properties similar to those of peppermint. Dose, ½ to 3 minims.

The preparation is *Spearmint Water*—strength, 1 in 1,000.

Pine Oil.—The oil distilled from the fresh leaves of *Pinus pumilio*, the mountain pine (Nat. Ord., Coniferæ). A native of Central Europe.

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* Genuine oils have sometimes a slightly lower specific gravity than this. See notes by the author, *Chemist and Druggist*, Sep. 24, 1898, p. 527, and by J. C. Umney, *Chemist and Druggist*, Nov. 14, 1903, p. 825.

Medicinally, pine oil is stimulating and antiseptic. It is inhaled for catarrhal affections and used externally for rheumatism.

Rosemary Oil.—The oil distilled from the flowering tops of *Rosmarinus officinalis* (Nat. Ord., Labiatæ). A native of the Mediterranean region. Medicinally the oil is stimulant and carminative. Dose, ½ to 3 minims.

Preparation.—Spirit of Rosemary. Strength, 1 in 10; dose, 5 to 30 minims.

The oil is also used in making soap liniment and compound tincture of lavender.

Oil of Sandal Wood, Oil of Santal Wood, Oleum Santali, P.B.—Distilled from the wood of *Santalum album* (Nat. Ord., Santalaceæ). Cultivated in India, but the oil is distilled in this country.

Medicinally, the oil is antiseptic, stimulant, and diuretic. Dose, 5 to 30 minims.

Turpentine Oil.—The oil distilled from the oleo-resin (crude turpentine) obtained from *Pinus sylvestris* and other species (see p. 107).

Medicinally, turpentine is antiseptic and diuretic, and in large doses anthelmintic.

The preparations are *Turpentine Liniment* and *Acetic Turpentine Liniment.*

Unofficial Plant Products.

Manna.—An exudation from the stem of *Fraxinus Ornus* (Nat. Ord., Oleaceæ). A native of Southern Europe.

A laxative, useful for children.

Euphorbium.—A gum-resin obtained from *Euphorbia resinifera* (Nat. Ord., Euphorbiaceæ).

A drastic purgative, never given now internally. Used externally in the form of plaster for chronic swellings of the joints.

Olibanum.—True frankincense. A gum-resin obtained from *Boswellia Carterii* and other species (Nat. Ord., Burseraceæ).

Used chiefly for incense.

Cetraria Islandica, Iceland Moss.—A lichen indigenous to this country, but collected chiefly in the mountainous parts of Central and Northern Europe. It contains a bitter principle, cetraric acid, and much starch.

Medicinally, it is demulcent, tonic, and nutritive.

Chondrus Crispus, Irish Moss.—A seaweed collected on the Atlantic shores in Ireland and the United States.

It contains a gelatinous principle and a trace of iodine.

Medicinally, it is demulcent.

Fucus Vesiculosus, Bladder-Wrack.—A common seaweed on the coasts of this country.

It contains a gelatinous substance and some iodine. It is the active ingredient of many anti-fat remedies.

Lycopodium.—The spores of the club-moss, *Lycopodium clavatum.*

It contains a fixed oil, also an alkaloid, *Lycopodine*, but is chiefly used as an inert dusting powder.

Dragon's Blood.—A resin which exudes from the fruit of *Calamus draco*, a palm which is indigenous to Sumatra and Borneo.

Used for colouring only.

Elemi.—An oleo-resin obtained from the Philippine Islands. The botanical source is unknown.

Used externally as a rubefacient.

Mastich.—A resin obtained from *Pistacia lentiscus* (Nat. Ord., Anacardiaceæ). Collected in the Grecian Archipelago.

Used in tooth-stopping.

Sandarac.—A resin from *Callitris quadrivalvis* (Nat. Ord., Coniferæ). A native of North-West Africa.

SECTION II.

ANIMAL SUBSTANCES.

CHAPTER X.

Animal Products, Fish Product, Insects and Insect Products.

ANIMAL PRODUCTS.

(a) From the ox, Bos taurus (Order, Ruminantia), are obtained milk sugar and ox bile.

Milk Sugar, Lactose.—A crystallized sugar, having the formula $C_{12}H_{22}O_{11},H_2O$, obtained from milk. It does not ferment, as does cane sugar, and is therefore useful for persons having a weak digestion, and particularly suitable for preparing foods for infants. It should be almost free from lactic acid.

In medicine it is used for triturating with potent salts in order to divide and dilute them.

Ox Bile, Fel Bovinum Purificatum.—The fresh bile is concentrated, then treated with rectified spirit, in which mucus is insoluble. The spirituous solution is decanted and filtered, the alcohol removed by distillation, and the residue concentrated to the consistence of a thick extract.

Medicinally, the drug is antiseptic and aperient, and is given where there is a deficiency of bile. Dose, 5 to 15 grains. As it is not desirable that the drug should act in the stomach, it is best given in the form of pills coated with keratine. Keratine is a substance prepared from horn; it is insoluble in gastric juice, and pills coated with it do not dissolve until they reach the intestines.

(*b*) *From the sheep, Ovis aries (Order, Ruminantia), are obtained prepared suet, wool fat, and thyroid gland.*

Prepared Suet, Sevum Præparatum.—The internal fat of the abdomen of the sheep, purified by melting and straining. It consists chiefly of stearine

$$\text{(Glyceryl stearate, } C_3H_5(C_{18}H_{35}O_2)_3\text{).}$$

With this *Mercury Ointment* is prepared.

Wool Fat, Adeps Lanæ.—The purified cholesterin* fat of sheep's wool.

Wool fat is readily absorbed by the skin, is not irritating, and is antiseptic.

From it is prepared *Hydrous Wool Fat,* a mixture of 7 parts of wool fat with 3 parts of water, used in making the official hemlock and hamamelis ointments.

Thyroid.—A dry powder prepared from the thyroid gland of the sheep. Fresh healthy glands are selected, minced and dried, and the fat removed by treatment with petroleum spirit.

Thyroid has been used in diseases in which the corresponding gland in the human body has become atrophied, and for certain skin diseases.

From it is prepared *Thyroid Solution.* A hundred minims contain the soluble portion of one gland, preserved with phenol (carbolic acid) and glycerin. Dose, 5 to 15 minims.

(*c*) *From the hog, Sus scrofa (Order, Ungulata), are obtained lard, pepsin, and pancreatic solution.*

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* So called because the alcohol *cholesterin* ($C_{27}H_{45}OH$) is obtained from it by saponification.

Lard.—The purified fat from the abdomen of the hog. Chemically, it consists of stearine, palmitine, and oleine (glyceryl oleate, $C_3H_5(C_{18}H_{33}O_2)_3$). Lard is largely adulterated with cotton-seed oil, the detection of which is somewhat difficult.

From it is made *Benzoated Lard*, which is prepared by mixing 3 parts of powdered benzoin with every 100 parts of melted lard. Benzoated lard is used for making cantharides plaster, phosphorus pills, and many official ointments. It is not suitable, however, for eye ointments.

Pepsin (Greek, πέπτω, *pepto*, I digest) is a digestive ferment obtained from the stomach of the hog, the sheep, or the calf. A solution in water acidulated with hydrochloric acid should dissolve 2,500 times its weight of hard-boiled white of egg at 105° F. in six hours.

From it is prepared *Glycerin of Pepsin*—strength, 5 grains in 1 fluid drachm ; dose, 1 to 2 fluid drachms.

Pancreatic Solution.—Contains the digestive principles of 5 parts of the fresh pancreas (sweetbread) of the pig in 20 fluid parts of alcohol (20 per cent.). It is best administered in alkaline solution.

Spermaceti, Cetaceum. — A concrete substance obtained from the head of the sperm whale, *Physeter macrocephalus* (Order, Cetacea), which inhabits the Pacific and Indian Oceans. Spermaceti occurs in crystalline, white, translucent, unctuous masses, having little taste or odour. It should not be more than very slightly acid.

Medicinally, it is emollient.

The preparation is *Spermaceti Ointment*, which contains, in addition to spermaceti, beeswax, almond oil, and powdered benzoin.

Musk. — A dried secretion obtained from the male musk deer, *Moschus mosciferus* (Order, Ungulata). It is a native of Central Asia. Musk is imported in the pods in which it is found on the animal. The drug consists of reddish-black unctuous grains. It is often grossly adulterated, and the Pharmacopœia requires that it shall not yield more than 8 per cent. of ash, the character of the ash being also important, that of the genuine drug being grey in colour.

Musk is a stimulant, aphrodisiac, and antispasmodic, but its high price prevents its being much used medicinally. Dose, 5 to 10 grains. It is largely used as a basis for perfumes.

Unofficial: **Castor.** — This drug (Latin, *castoreum*) should not be confounded with castor oil, which is a vegetable product (see p. 109). Castor consists of the dried preputial follicles of the beaver, *Castor fiber* (Order, Rodentia). A native of North America and Russia.

Medicinally, it is stimulant and antispasmodic. Dose, 5 to 10 grains.

Animal or Curd Soap.—Soap made with sodium hydrate and a purified animal fat, consisting chiefly of stearin. The soap, therefore, is chiefly sodium stearate. It contains also about 30 per cent. water.

Leeches (Hirudo, P.B.).—Leeches are of two kinds—*Sanguisuga medicinalis*, the speckled leech, and *Sanguisuga officinalis*, the green leech. They are aquatic worms belonging to the Order Hirudinæ. They are bred chiefly in Germany and France. The name comes from an old Anglo-Saxon word signifying to heal. (A physician was formerly called a leech.)

Leeches are used to suck blood in local inflammations.

FISH PRODUCT.

Cod-Liver Oil, Oleum Jecoris Aselli or Oleum Morrhuæ.—The oil extracted from the fresh livers of codfish, *Gadus morrhua* (Order, Teleostei), purified by cooling to about 23° F., and rejecting the solid fat, which separates.

Cod-liver oil contains the alkaloids, *Choline*, *Aselline*, and *Morrhuine*, and also a trace of iodine.

Cod-liver oil is nutritive, and particularly useful in wasting diseases. It aids in the absorption and assimilation of other foods. Dose, 1 to 4 fluid drachms.

INSECTS AND INSECT PRODUCTS.

Official.

Cantharides.—The dried beetles or Spanish flies, *Cantharis vesicatoria* (Order, Coleoptera). The flies are about $\frac{3}{4}$ inch long by $\frac{1}{4}$ inch broad, bright-green in colour, and have a strong and disagreeable odour. They are collected in various parts of Southern Europe, by shaking the insects from the trees on which they gather in large numbers, and killing them by heat or by the fumes of burning sulphur or of ammonia. They contain about $\frac{1}{2}$ per cent. of a crystalline principle, *Cantharidin*.

Medicinally, cantharides is diuretic and emmenagogue, but it is seldom given internally. Externally, it is used as a rubefacient and vesicant. It is also used as a stimulating application to the skin of the head to promote the growth of hair.

The preparations are:

1. *Vinegar of Cantharides.* Made by macerating and percolating the bruised beetles with a mixture of glacial acetic acid and water. Strength, 1 in 10.

2. *Warming Plaster*, *Emplastrum Calefaciens*, P.B.—strength, 1 in 25.

3. *Cantharides Plaster*—strength, about 1 in 3.

4. *Blistering Liquid, Liquor Epispasticus*, P.B. Prepared by percolating powdered cantharides with acetic ether. Strength, 1 in 2.

5. *Tincture of Cantharides.* Prepared by macerating powdered cantharides with rectified spirit. Strength, 1 in 80; dose, 5 to 15 minims, or if frequently repeated, 2 to 5 minims.

6. *Cantharides Ointment.* Made by digesting bruised cantharides in melted benzoated lard for twelve hours. The product is strained through calico and stirred until cold. Strength, about 1 in 10.

Two varieties of Chinese beetles are imported—viz., *Mylabris phalerata* and *Mylabris cichorii.* They are easily distinguished from the official drug.

Cochineal. — The dried fertilized female insects, *Coccus cacti* (Order, Hemiptera). Collected chiefly in the Canary Islands, where they were formerly looked upon as a plague, but are now a source of profit. There are two commercial varieties: (1) The silver grain, to prepare which the insects are killed by the fumes of sulphur or charcoal; and (2) the dark grain, which is obtained by killing the insects by heat.

Cochineal contains about 10 per cent. of *Carminic Acid,* and is only used as a colouring agent.

The preparation is the *Tincture*—strength, 1 in 10; dose, 5 to 15 minims. A valuable indicator of the end reaction in alkalimetry.

Carmine is prepared from cochineal.

Unofficial: **Shellac.** — The fertilized female insects *Coccus lacca* settle on certain trees and become enclosed by a resinous exudation. This resin when purified forms the shellac of commerce.

Yellow Beeswax, Cera Flava, is obtained from the honeycomb of the hive bee, *Apis mellifica* (Order, Hymenoptera). (*Mellifica* is literally "the sweet-maker," from the Latin, *mellis*, sweet, and *facio*, *fici*, I make.) Beeswax is often adulterated with paraffin, etc. The melting-point and specific gravity are valuable tests; the former should be between 144·5° and 147° F., and the latter between 0·960 and 0·970. Genuine beeswax is destroyed by hot sulphuric acid, and advantage is taken of this character in the following official test: If 5 grammes are heated for fifteen minutes with 25 grammes of sulphuric acid to 320° F. and the mixture diluted with water, no solid wax-like body should separate. Yellow wax is used for making several plasters and ointments.

White Beeswax, Cera Alba, is yellow beeswax which has been bleached by exposure to moisture, air, and light.

Clarified Honey, Mel Depuratum.—Honey (the saccharine secretion of the hive bee) melted and strained.

Honey is demulcent and nutritious, and in large doses laxative.

The preparations are:

1. *Oxymel* (Greek, ὀξύς, *oxys*, sharp; μέλι, *meli*, honey). A mixture of honey and acetic acid diluted with water to a specific gravity 1·320. Dose, 1 to 2 fluid drachms.

2. *Oxymel of Squill* (see p. 36).

SECTION III.

CHEMICALS.

CHAPTER XI.

Metals and Salts.

Potassium.—Potassium (symbol K, from the Latin name *Kalium;* atomic weight, 38·83) occurs in Nature as chloride and sulphate in minerals; it is obtained from plant ashes as carbonate, and is found in grape-juice as an acid tartrate.

Potassium Hydroxide, Caustic Potash. — The official caustic potash must contain at least 90 per cent. of true hydroxide (KOH). It is prepared by the interaction of potassium carbonate and calcium hydroxide, potassium hydroxide and calcium carbonate (chalk) being formed. The solution of potassium hydroxide is evaporated to dryness, and the residue fused and moulded in sticks or cakes.

Caustic potash is a powerful escharotic.

The preparation is the *Solution of Potash*—strength, about 6 per cent.; dose, 10 to 30 minims, freely diluted.

Sulphurated Potash, Liver of Sulphur.—So called because of its colour. A mixture of salts of potassium, chiefly sulphides, prepared by fusing potassium carbonate with sublimed sulphur.

It has similar medicinal properties to those of sulphur when given in small doses, but is poisonous in large doses.

Potassium Acetate. — In white satiny lumps or granular powder. Prepared by the interaction of acetic acid and potassium carbonate, acetate of potassium and carbonic acid being formed. The product is fused in a partially-closed vessel.

Medicinally, the salt is diuretic and renders the urine alkaline, dissolving any uric acid stones that may have formed. Dose, 10 to 60 grains.

Potassium Bicarbonate, Acid Carbonate of Potassium, Potassium Hydrogen Carbonate.—A white crystalline powder. Prepared by saturating a strong aqueous solution of potassium carbonate with carbonic anhydride. (Bicarbonate means that the salt contains twice as much carbonic acid radical in proportion to potassium as does the normal potassium carbonate.)

Medicinally, the salt is antacid and diuretic. Dose, 5 to 30 grains.

It is used for making effervescing mixtures, and it is useful to remember that 20 parts of potassium bicarbonate are neutralised by 14 parts of citric acid and by 15 parts of tartaric acid.

Potassium Carbonate, Salt of Tartar (so called from its corrosive nature; from *tartarus*, hell).—A white crystalline powder. It may be obtained from the ashes of wood.

It is seldom given internally, as it is corrosive and irritant. Externally, it is used in the form of lotion for eczema and other skin diseases. Dose, 5 to 20 grains.

Potassium Bichromate, Potassium Dichromate, Red Chromate of Potassium. — Large orange-red crystals. Prepared from chrome ironstone by roasting with lime, and treating the resulting chromate with acid.

An irritant poison, rarely used in medicine. Dose, $\frac{1}{10}$ to $\frac{1}{3}$ grain.

Potassium Bromide.—White cubical crystals. Prepared by adding an excess of bromine to a strong solution of hydroxide of potassium, evaporating the resulting solution of potassium bromide and bromate to dryness, reducing the bromate to bromide by fusing with charcoal, and purifying the bromide by crystallization.

A sedative and hypnotic. Dose, 5 to 30 grains.

Potassium Chlorate.*—White crystals.

A local stimulant. Dose, 5 to 15 grains.

The preparation is the *Potassium Chlorate Lozenge.* Each lozenge contains 3 grains of the chlorate.

Potassium Citrate.—A white powder, prepared by the interaction of citric acid and potassium carbonate.

Medicinally, the citrate is diaphoretic, and in large doses purgative. Dose, 10 to 40 grains.

Potassium Iodide.—Colourless cubic crystals. Prepared similarly to potassium bromide.

Medicinally, the salt is alterative and resolvent (causing the absorption of swellings). Dose, 5 to 20 grains.

The preparations are:

1. *Liniment of Potassium Iodide with Soap*—strength, about 1 in 10.
2. *Potassium Iodide Ointment*—strength, 1 in 10.

Used also in making strong solution of iodine, tincture of iodine, and iodine ointment. (See page 150.)

Potassium Nitrate, Nitre, Saltpetre. — White crystalline masses, obtained from crude nitre, or by the interaction of sodium nitrate and potassium chloride.

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* Chlorates easily part with the oxygen they contain, and form explosive compounds with charcoal, sulphur, reduced iron, tartaric acid, and many other readily oxidisable substances. It is important to remember this in dispensing. They are also incompatible with mineral acids, chlorine gas being evolved.

Medicinally, the salt is diuretic and diaphoretic. Dose, 5 to 20 grains.

Potassium Permanganate. — Dark-purple slender crystals, obtained by the interaction of potassium chlorate, potassium hydroxide, and manganese dioxide.

A powerful oxidiser, and hence useful as a deodoriser and disinfectant. Dose, 1 to 3 grains.

The preparation is the *Solution of Potassium Permanganate*—strength, 1 per cent.; dose, 2 to 4 fluid drachms.

Potassium Sulphate. — White, very hard crystals, prepared either by purifying the crude sulphate, or by the interaction of sulphuric acid and salts of potassium.

A mild cathartic and hepatic stimulant; also used to minutely divide drugs in powders and pill masses. Dose, 10 to 40 grains.

Potassium sulphate is used in making compound colocynth pill, colocynth and henbane pill, ipecacuanha and squill pill, and compound ipecacuanha powder.

Potassium Tartrate.—Small white crystals, obtained by neutralising acid tartrate of potassium (see below) with potassium carbonate.

The salt has similar medicinal properties to the acetate and citrate of potassium. Dose, 30 to 240 grains.

Acid Potassium Tartrate, Purified Cream of Tartar.—Acid tartrate of potassium occurs in grape-juice, and, being less soluble in alcohol than in water, is deposited as the juice ferments. It is called "cream" of tartar, because a solution of crude tartar which has been boiled is covered with a crust of minute crystals, similar to the cream of milk. Purified cream of tartar is a gritty, white powder, containing 97·5 per cent. pure acid potassium tartrate.

Medicinally, it is a mild purgative and diuretic. Dose, 20 to 60 grains.

Used in making the *Confection of Sulphur* and *Compound Jalap Powder*.

Soft Soap is made by boiling olive oil, which is mainly oleate of glyceryl, with solution of potassium hydroxide. The soap is therefore essentially an oleate of potassium, and may fitly be classed amongst the compounds of that metal.

The preparation is the *Soap Liniment*, which is a spirituous solution of soft soap, containing also camphor and oil of rosemary. Soap liniment is one of the four official liniments which may legally be made with methylated spirit. If sold, however, it must be distinctly stated that it is a methylated preparation, or an offence against the Food and Drugs Acts will be committed Soap liniment is used for making liniment of opium (see p. 80).

Soft soap is also used in the preparation of turpentine liniment.

Sodium is very abundant in Nature, occurring as chloride, in the form of common salt, rock-salt, and sea-salt; as nitrate (Chili saltpetre or Chili nitre); also as carbonate, borate, and sulphate. The metal is soft, and as it is readily oxidised with the evolution of much heat, must be kept in mineral naphtha.

The preparation is the *Solution of Sodium Ethylate*. It is prepared by dissolving 22 grains of the metal in 1 fluid ounce of absolute alcohol, ethylate of sodium being formed and dissolved in the excess of alcohol.

The solution is used as a caustic.

Sodium Arsenate.—The anhydrous salt *disodium hydrogen arsenate*, (Na_2HAsO_4). The dried salt is used because the crystalline sodium arsenate soon loses a portion of its combined water, and therefore varies in strength.

It is essentially a preparation of arsenium, having similar medicinal properties to those of "arsenical solution" (see p. 143), which is a solution of potassium arsenite. Dose, $\frac{1}{40}$ to $\frac{1}{10}$ grain.

The preparation is the *Solution of Sodium Arsenate*—strength, 1 per cent.; dose, 2 to 8 minims.

Sodium Benzoate.—Obtained by neutralising benzoic acid with sodium carbonate. The salt has similar medicinal properties to those of benzoic acid, being antiseptic and diuretic. Dose, 5 to 30 grains.

Sodium Bicarbonate.—Prepared by treating crystalline sodium carbonate with carbonic anhydride, or by the interaction of sodium chloride and ammonium bicarbonate.

Medicinally, it is antacid.

It is less irritating than potassium bicarbonate. Dose, 5 to 30 grains.

The preparations are:

1. *Sodium Bicarbonate Lozenge.* Each lozenge contains 3 grains of the bicarbonate.

2. *Effervescent Citrotartrate of Sodium.* Prepared by mixing together sodium bicarbonate, tartaric acid, citric acid, and sugar, and granulating the mixture by heat. The so-called "citrate of magnesia" of commerce is a similar preparation. Antacid and laxative. Dose, 60 to 120 grains.

Sodium Carbonate.—The crystalline salt.

More caustic and irritating than the bicarbonate. Dose, 5 to 30 grains.

The preparation is the *Dried Sodium Carbonate.* Nearly free from water. Ten grains is equal to about $26\frac{1}{2}$ grains of the crystalline carbonate. Dose, 3 to 10 grains. Used in making iron pill (see p. 142).

Sodium Bromide.—White cubic crystals. Prepared similarly to potassium bromide.

Medicinally, it acts like potassium bromide, but is less irritating and less depressing. Dose, 5 to 30 grains.

Sodium Iodide. — Prepared similarly to potassium iodide, and has like medicinal properties, but is more assimilable. Dose, 5 to 20 grains.

Sodium Chloride, Purified Common Salt.—Salt is essential to life; in small doses it is antiseptic, stimulant, and tonic, in large emetic and purgative. Given in the form of an enema, it acts as an anthelmintic.

Sodium Biborate, Borax.—Is found in Peru, Chili California, etc.

It is antiseptic, and has therefore been largely used as a food preservative, but impairs digestion if used in excessive quantities. It is also used as a local application for the mouth and throat. Dose, 5 to 20 grains.

The preparations are:

1. *Glycerin of Borax*—strength, about 1 in 7. The glycerin converts some of the borax into boric acid.

2. *Borax Honey*—strength, about 1 in 10.

Sodium Hypophosphite. — Prepared by the interaction of sodium carbonate and calcium hypophosphite.

A nervine tonic. Dose, 3 to 10 grains.

Sodium Phosphate. — In transparent colourless crystals. Prepared from bone ash, which is crude calcium phosphate.

Medicinally, it is purgative, and in small doses diuretic. Dose, 30 to 120 grains for repeated administration, $\frac{1}{4}$ to $\frac{1}{2}$ ounce for a single dose.

The preparation is the *Effervescent Sodium Phosphate*, a granular product containing tartaric and citric acids and bicarbonate of sodium, and therefore effervescing briskly when dissolved. Strength, 1 (of sodium phosphate) in 2. Dose, 60 to 120 grains for repeated administration, $\frac{1}{4}$ to $\frac{1}{2}$ ounce for a single dose.

Sodium Nitrite. — Prepared by reducing sodium nitrate by fusion with metallic lead.

Medicinally, the salt reduces arterial pressure, and is used in cases of angina, etc. Dose, 1 to 2 grains.

Sodium Salicylate. — Small colourless scales or crystals. Obtained by the interaction of sodium carbonate or hydroxide with salicylic acid.

Antipyretic and antiseptic. Used largely for rheumatic affections. Dose, 10 to 30 grains.

Sodium Sulphate, Glauber's Salt.—A crystalline salt, obtained by the interaction of sodium salts and sulphuric acid.

Medicinally, it has a purgative action. Dose, 30 to 120 grains for repeated administration, $\frac{1}{4}$ to $\frac{1}{2}$ ounce for a single dose.

The preparation is the *Effervescent Sodium Sulphate*—strength, 1 (of sodium sulphate) in 2; dose, 60 to 120 grains for repeated administration, $\frac{1}{4}$ to $\frac{1}{2}$ ounce for a single dose.

Sodium Sulphite.—Obtained by the interaction of sulphurous acid and sodium carbonate.

A weak antiseptic. Dose, 5 to 20 grains.

Sodium Sulphocarbolate. — When carbolic acid (phenol) is treated with hot sulphuric acid, sulphocarbolic acid is formed, and from this acid the sulphocarbolates are obtained.

The sodium salt has similar medicinal properties to those of carbolic acid, being antiseptic and antipyretic. Dose, 3 to 15 grains.

Sodium Potassium Tartrate, Tartarated Soda, Rochelle Salt.—This salt was discovered by an apothecary of Rochelle—hence its popular name. It is prepared by the interaction of sodium carbonate and acid potassium tartrate.

A saline purgative and feeble diuretic. Dose, 120 to 240 grains.

The preparation is the *Effervescent Tartarated Soda Powder* (*Seidlitz Powder*). A mixture of 120 grains of Rochelle salt with 40 grains sodium bicarbonate; taken in water with 38 grains of powdered tartaric acid.

Hard Soap is made by the interaction of sodium hydroxide and olive oil, and therefore consists chiefly of sodium oleate.

Ammonium.—The radical NH_4 combines with acids to form salts, similar to those of potassium and sodium. Ammonium salts were formerly obtained from certain volcanic products, and also from animal substances, such as horns, putrid urine, etc. They are now, however, chiefly obtained from the ammonia gas (NH_3), produced as a by-product in the manufacture of coal-gas.

The official preparations are:

1. *Strong Solution of Ammonia.* A solution containing an amount of ammonium hydroxide (NH_4HO) equivalent to 32·5 per cent. by weight of ammonia gas (NH_3). It is prepared by heating a mixture of ammonium chloride and slaked lime, and passing the ammonia gas which is evolved into water. The specific gravity of the strong solution is 0·891, that of the saturated solution, which is usually sold, being 0·880.

Strong solution of ammonia is a colourless caustic liquid having a very pungent odour. Bottles containing it should be kept in a cool place and opened cautiously.

From it are prepared:

(*a*) *Ammoniated Liniment of Camphor* (see p. 105).

(*b*) *Aromatic Spirit of Ammonia* (see p. 131).

(*c*) *Fetid Spirit of Ammonia.* A mixture of strong solution of ammonia with an alcoholic solution of the volatile constituents of asafetida.

2. *Solution of Ammonia.* Prepared by diluting the strong solution. Strength, 10 per cent. by weight of ammonia gas (NH_3). The solution is sometimes known as liquor volatilis cornu cervi, or spirit of hartshorn, because it was formerly made from harts' horns.

Preparation.—Liniment of Ammonia. A mixture of solution of ammonia with almond and olive oils.

Ammonium Benzoate. — In colourless lamellar (Latin, *lamella*, a thin plate) crystals. Prepared by neutralising benzoic acid with solution of ammonia.

Medicinally, the salt acts as a diuretic; it is more soluble, and therefore more active, than benzoic acid, and is less irritating. Dose, 5 to 15 grains.

Ammonium Bromide. — Small colourless crystals, prepared by neutralising hydrobromic acid with solution of ammonia.

Medicinally, it is a nervine sedative and hypnotic, and is less depressing than bromide of potassium. It is also used in whooping-cough, acting as an antispasmodic and expectorant. Dose, 5 to 30 grains.

Ammonium Carbonate, Sal Volatile.—The official salt is not the true carbonate, but is a mixture of the acid salt (NH_4HCO_3) and ammonium carbamate ($NH_4NH_2CO_2$). It is prepared by heating ammonium sulphate or chloride with calcium carbonate, the ammonium carbonate which is formed being vaporised by the heat and condensed on a cool receiver. This process is known as sublimation, and is practically dry distillation. The commercial salt occurs in translucent crystalline masses, which on exposure to the air become covered with a white efflorescence.

Medicinally, ammonium carbonate is stimulant and expectorant. It is a powerful antiseptic. Dose, 3 to 10 grains.

The preparation is the *Aromatic Spirit of Ammonia.* (Syn.: *Compound Spirit of Ammonia, Spirit of Sal Volatile*), a spirituous solution of ammonium hydroxide, ammonium carbonate, and the volatile oils of nutmeg and lemon. Dose, 20 to 40 minims, well diluted, for repeated administration; 60 to 90 minims, well diluted, for a single dose.

Ammonium carbonate is also used in making *Solution of Ammonium Acetate*—dose, 2 to 6 fluid drachms; and *Solution of Ammonium Citrate* — dose, 2 to 6 fluid drachms.

Ammonium Chloride. — Colourless crystals, prepared by neutralising ammonium salts with hydrochloric acid. (Crude chloride of ammonium is known as sal ammoniac.)

Medicinally, ammonium chloride is a stimulant expectorant. Dose, 5 to 20 grains.

Ammonium Phosphate.—This is an acid salt having the formula $(NH_4)_2HPO_4$. The salt occurs in transparent, colourless prismatic crystals, and is prepared by neutralising phosphoric acid with solution of ammonia.

Medicinally, it is diuretic and diaphoretic. Dose, 5 to 20 grains.

Lithium Carbonate is obtained from minerals in which the metal exists as silicate and fluoride. It occurs in white powder or minute crystalline grains.

Medicinally, it is given in gout to increase the alkalinity of the blood. Dose, 2 to 5 grains.

Lithia Water (*Unofficial*) is an aerated solution of the carbonate, containing 10 grains in the pint.

Lithium Citrate.—White deliquescent crystals, prepared by neutralising citric acid with lithium carbonate.

It has similar medicinal properties to, but is more soluble than, the carbonate. Dose, 5 to 10 grains.

The preparation is the *Effervescent Lithium Citrate.* This contains 5 per cent. lithium citrate. Dose, 60 to 120 grains.

CHAPTER XII.

Metals and Salts (*continued*).

Calcium is one of the most abundant metals, occurring naturally as *Carbonate*, in the form of chalk, marble, limestone, etc.; as *Sulphate*, in the form of gypsum; also as *Silicate* and *Fluoride*.

Calcium Oxide, Lime, Quicklime, has been known and used for making mortar from the earliest times. It is obtained by burning chalk, limestone, or marble, the carbonate being reduced to oxide and carbonic anhydride evolved.

Calcium Hydroxide, Slaked Lime.—Prepared by adding water to quicklime. Should be recently prepared.

It is used for preparing:

1. *Solution of Lime, Lime-Water.* This contains the equivalent of ½ grain of oxide (CaO) in each fluid ounce, but quickly loses strength if exposed to the air by formation of the insoluble carbonate. It has antacid properties, and is a useful addition to milk for infants, as it breaks up the curd. Dose, 1 to 4 fluid ounces.

Slaked lime is more soluble in a saccharine solution than in water. The following preparation is therefore official.

2. *Saccharated Solution of Lime.* Calcium hydroxide is dissolved in a 10 per cent. solution of sugar. The re-

sulting solution contains about 8 grains of oxide (CaO) in each fluid ounce. Dose, 20 to 60 minims.

Chlorinated Lime, Bleaching Powder (commonly but erroneously called **Chloride of Lime**), is a mixture of hypochlorite and chloride of calcium with some hydroxide. It is prepared by acting on moistened slaked lime with chlorine gas. It readily breaks up, yielding much chlorine gas, and therefore acts as a disinfectant and deodoriser as well as a bleaching agent. It is officially enjoined that the powder should yield at least 33 per cent. chlorine, but only a well-kept sample will do this.

The preparation is the *Solution of Chlorinated Lime.* This is prepared by mixing 1 part of chlorinated lime with 10 parts of distilled water, shaking occasionally during three hours, and filtering the mixture. The resulting product should yield not less than 2 per cent. chlorine gas.

Sulphurated Lime. — A greyish-white powder, smelling of sulphuretted hydrogen, prepared by fusing native gypsum (calcium sulphate) with charcoal. The product contains about half its weight of calcium sulphide with unconverted sulphate and carbon.

Medicinally, it is antisuppurative. Dose, $\frac{1}{4}$ to 1 grain.

Calcium Carbonate is used in pharmacy in two forms:

1. *Prepared Chalk*, which is the native carbonate purified by washing. An amorphous white powder. Antacid. Dose, 10 to 60 grains.

From this are prepared *Mercury with Chalk*, *Aromatic Powder of Chalk*, *Chalk Mixture*, *Aromatic Powder of Chalk with Opium.*

2. *Precipitated Chalk.* Calcium carbonate, prepared by the interaction of calcium chloride and sodium carbonate. A white crystalline powder.

It is an antacid. Dose, 10 to 60 grains. It is used in making *Compound Bismuth Lozenges.*

Calcium Chloride is prepared by adding the carbonate to hydrochloric acid. The resulting crystals are dried until they have the composition of 1 molecule of chloride of calcium with 2 molecules of water ($CaCl_2,2H_2O$).

It is used as an alterative in scrofula and tuberculosis. Dose, 5 to 15 grains.

Calcium Hypophosphite is obtained by the interaction of phosphorus, calcium hydroxide, and water.

It is a nerve tonic. Dose, 3 to 10 grains.

Calcium Phosphate, Purified Bone Ash.—Calcium phosphate is an essential constituent of the human body, but the salt given in medicinal doses seems to act as a nerve tonic. Dose, 5 to 15 grains.

Magnesium occurs naturally as carbonate, sulphate and chloride.

Light Magnesium Carbonate. — An hydroxycarbonate, having the formula $3(MgCO_3)Mg(HO)_2,4H_2O$. A very light, partly crystalline powder, prepared by mixing *dilute* solutions of magnesium sulphate and sodium carbonate, boiling the mixture, and washing and drying the precipitate which forms. Insoluble in water.

Medicinally, it acts as an antacid and purgative. Dose, 5 to 30 grains for repeated administration, 30 to 60 grains for a single dose.

Heavy Magnesium Carbonate.—This has the same chemical composition as the light carbonate, but is denser. It is insoluble in water. It is prepared by mixing *concentrated* solutions of magnesium sulphate and sodium carbonate.

Its medicinal properties and dose are the same as those of the light carbonate.

The preparations are :

1. *Solution of Magnesium Carbonate.* Fluid magnesia. A solution of the carbonate in water impregnated with carbonic anhydride. Strength, about 2 per cent. of the official carbonate; dose, 1 to 2 fluid ounces.

2. *Compound Bismuth Lozenges.* Each lozenge contains 2 grains of magnesium carbonate.

Light Magnesia, Light Calcined Magnesia, Light Magnesium Oxide (MgO). — Prepared by heating the light carbonate until it ceases to effervesce with dilute acid. Insoluble in water.

Its medicinal properties are similar to those of the carbonate. Dose, 5 to 30 grains for repeated administration, 30 to 60 grains for a single dose.

The preparation is *Compound Rhubarb Powder.*

Heavy Magnesia, Heavy Calcined Magnesia, Heavy Magnesium Oxide (MgO).—Prepared by heating the heavy carbonate.

It has the same chemical composition as light magnesia, but is less bulky. Dose, 5 to 30 grains for repeated administration, 30 to 60 grains for a single dose.

Heavy magnesia can be used in place of light magnesia in making *Compound Rhubarb Powder.*.

Magnesium Sulphate, Epsom Salt ($MgSO_4,7H_2O$). —Originally obtained by evaporation of the water from a spring at Epsom. The official salt is prepared by the interaction of the native carbonates and dilute sulphuric acid, or by purifying the native sulphate.

Medicinally, it is the best saline purgative. Dose, 30 to 120 grains for repeated administration, $\frac{1}{4}$ to $\frac{1}{2}$ ounce for a single dose.

The preparation is the *Effervescent Magnesium Sulphate.* It contains half its weight of the crystalline sulphate. Dose, 60 to 240 grains for repeated administration, $\frac{1}{2}$ to 1 ounce for a single dose.

Epsom salt is also a constituent of black draught (compound mixture of senna).

Zinc occurs in Nature as sulphide and carbonate (calamine).

The following are the official compounds :

1. *The Oxide* (ZnO). Insoluble in water. Prepared by heating the carbonate until it ceases to effervesce with dilute acid ; or by burning the metal. The latter process yields a whiter oxide than is obtained from the carbonate.

Administered internally, the oxide acts as a mild astringent and tonic. It is used externally as an astringent and absorbent in skin affections. Dose, 3 to 10 grains.

From this is prepared *Zinc Ointment*, which contains 15 per cent. of the oxide mixed with benzoated lard.

2. *The Carbonate*, or *Hydroxycarbonate*

$$(ZnCO_3,2Zn(HO)_2H_2O),$$

is produced by the interaction of zinc sulphate and sodium carbonate. It is insoluble in water. Medicinally it acts similarly to the oxide.

The native normal carbonate ($ZnCO_3$), which is known as calamine, is purified by calcination and elutriation (Latin, *eluo*, I wash out), a method of washing and decantation by which the lighter and finer particles are separated from the grosser ones.

It is used externally as an astringent and absorbent.

Zinc Acetate is prepared by neutralising acetic acid with zinc carbonate. It is soluble in water.

Medicinally, it acts as an astringent. Dose, 1 to 2 grains.

Zinc Chloride is prepared by the interaction of zinc and hydrochloric acid. It occurs in opaque sticks or tablets, which are very deliquescent and caustic.

Its chief use is as a caustic, but it is also used in very dilute solutions as an astringent and antiseptic injection.

The *Solution of Zinc Chloride* of the Pharmacopœia is prepared directly from the metal and hydrochloric acid. It contains 366 grains of the chloride in each fluid ounce, and is used, largely diluted, as an antiseptic lotion.

Zinc Sulphate, White Vitriol (from Latin, *vitrum*, glass—hence a transparent substance), is isomorphous (Greek, ἶσος, *isos*, like; μορφὴ, *morphē*, form) with magnesium sulphate. Apart from chemical tests, it can only be distinguished from that salt by its astringent taste. Its composition is indicated by the formula $ZnSO_4,7H_2O$, and it is prepared by the interaction of dilute sulphuric acid and zinc. It is soluble in water.

Medicinally, it acts as an astringent and tonic, and in large doses is an emetic. Dose, 1 to 3 grains as a tonic, 10 to 30 grains as an emetic.

Zinc Sulphocarbolate is prepared by heating a mixture of carbolic and sulphuric acids, and saturating the resulting sulphocarbolic acid with zinc oxide.

It is used in dilute solution as an antiseptic lotion.

Zinc Valerianate is prepared by acting upon zinc carbonate with valerianic acid,* or by the interaction of zinc sulphate and sodium valerianate.

Valerianate of zinc, which is only slightly soluble in water, is a valuable nerve tonic. Dose, 1 to 3 grains.

Alum.—A double sulphate of aluminium and potassium (potash alum), or aluminium and ammonium (ammonia alum). Colourless crystalline masses, soluble in water.

Medicinally, it is astringent. Dose, 5 to 10 grains.

The preparation is the *Glycerin of Alum.*

Dried Alum.—Potash alum heated until it has lost nearly half its weight of water of crystallisation.

Used externally as a styptic and caustic.

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* Valerianic acid can be obtained from valerian root (see p. 32), but is usually prepared by the oxidation of amylic alcohol.

Iron has been used medicinally for many centuries. It is a valuable tonic and hæmatic (blood tonic), and many of its preparations are also astringent. The metal itself is officially recognised in the form of wire or nails, which should be free from oxide (rust).

Iron is used for making:

1. *Iron Wine* (Syn.: *Steel Wine*), which is prepared by macerating the wire in sherry wine for thirty days. The product contains a variable amount of iron (about 0·3 per cent.) in combination with the vegetable acids of the wine. Dose, 1 to 4 fluid drachms.

2. *Strong Solution of Ferric Chloride.* The wire is first dissolved in hydrochloric acid, a solution of ferrous chloride being formed. This is oxidised to ferric chloride by means of nitric acid. The resulting solution contains 22·5 per cent. iron as ferric chloride.

From this solution are made:

(*a*) *Solution of Ferric Chloride*—strength, 5·625 per cent. iron; dose, 5 to 15 minims.

(*b*) *Tincture of Ferric Chloride*, which is the same strength as the solution, but contains also about 22 per cent. alcohol. Dose, 5 to 15 minims.

3. *Solution of Ferric Nitrate.* Prepared by dissolving the metal in nitric acid and water. Strength, 3·3 per cent. iron; dose, 5 to 15 minims.

4. *Syrup of Ferrous Iodide.* A mixture of a solution of freshly-prepared ferrous iodide with syrup. Strength, 10 per cent. of ferrous iodide; dose, ½ to 1 fluid drachm.

5. *Syrup of Ferrous Phosphate.* A mixture of a solution of freshly-prepared ferrous phosphate with syrup. Strength, nearly 2 per cent. of anhydrous ferrous phosphate; dose, ½ to 1 fluid drachm.

6. *Syrup of Phosphate of Iron with Quinine and Strychnine*, "*Easton's Syrup.*" A mixture of a solution of freshly-prepared ferrous phosphate, strychnine and

quinine sulphate with syrup. Strength, about 2 per cent. of anhydrous ferrous phosphate; dose, ½ to 1 fluid drachm (see also p. 91).

Reduced Iron is a fine greyish-black powder, consisting of about 75 per cent. metallic iron, with iron oxide. It is prepared by acting on heated ferric hydroxide with dry hydrogen gas. Dose, 1 to 5 grains.

Ferrous Salts.—The compounds of ferrous iron are more easily absorbed and are less irritating than those of the metal in the ferric condition.

Ferrous Sulphate.—Prepared by the interaction of diluted sulphuric acid and iron. When dried at 100° C. (212° F.), it loses 40 per cent. of water, leaving a nearly white powder, which is the *Exsiccated or Dried Ferrous Sulphate* of the British Pharmacopœia. Dose, ½ to 3 grains.

Ferrous sulphate is used in making *Solution of Ferric Sulphate.*

Solution of ferric sulphate is used in making *Iron and Ammonium Citrate.* Ferric hydroxide is precipitated by the addition of solution of ammonia and dissolved in a solution of citric acid. Solution of ammonia is added, the product filtered and evaporated to the consistence of syrup. It is then dried in thin layers on flat porcelain or glass plates at a low temperature. The resulting deep-red transparent scales consist of iron and ammonium citrate, and contain an amount of iron equal to about 30 per cent. ferric oxide. Dose, 5 to 10 grains.

Wine of Iron Citrate is prepared by dissolving iron and ammonium citrate in orange wine—strength, 1 grain in each fluid drachm; dose, 1 to 4 fluid drachms.

Iron and Quinine Citrate is a similar preparation, containing ferric citrate, ammonium citrate, and quinine citrate. Dose, 5 to 10 grains.

Tartarated Iron. — Prepared by mixing freshly-precipitated ferric hydroxide and acid potassium tartrate, dissolving in water, concentrating and drying in the same manner as described under iron and ammonium citrate. The dose of the thin transparent scales, which are of a deep garnet colour, is 5 to 10 grains.

Solution of Ferric Acetate is prepared by dissolving freshly-precipitated ferric hydroxide in glacial acetic acid, and diluting the product with water. Strength, about 2·6 per cent. iron; dose, 5 to 15 minims.

Other preparations of ferrous sulphate are:

1. *Iron Arsenate.* Ferrous arsenate with ferric arsenate and some oxide. An amorphous powder of a green colour.

Its medicinal properties are similar to those of arsenious oxide (see p. 143), the iron present being insufficient to be of any medicinal value in the small dose which can safely be given. Dose, $\frac{1}{16}$ to $\frac{1}{4}$ grain.

Arsenate of iron is prepared from ferrous sulphate and sodium arsenate, with the addition of sodium bicarbonate to neutralise any sulphuric acid which may be formed.

2. *Saccharated Iron Carbonate.* Prepared by dissolving ferrous sulphate and normal ammonium carbonate in boiling distilled water and mixing the solutions. Ferrous carbonate and ammonium sulphate are formed, the former being precipitated. The ferrous carbonate is washed and mixed with refined sugar, and the mixture dried. Saccharated iron carbonate should contain about one-third of its weight of ferrous carbonate ($FeCO_3$). Dose, 10 to 30 grains.

3. *Iron Phosphate.* Contains nearly half its weight of hydrous ferrous phosphate, $Fe_3(PO_4)_2 8H_2O$, with ferric phosphate and iron oxide. Dose, 5 to 10 grains.

4. *Compound Mixture of Iron* (Syn.: *Griffith's Mixture*). Prepared by mixing a solution of ferrous sulphate with a mixture of potassium carbonate, myrrh, sugar, spirit of

nutmeg, and rose-water; ferrous carbonate and potassium sulphate being formed. Dose, $\frac{1}{2}$ to 1 fluid ounce.

Dispensing Note.—The mixture should be kept without the iron; the latter can be added as required.

5. *Blaud's Pill.* This is the name by which the official iron pill is known, Dr. Blaud, a French physician, being the originator of the formula, which, with slight modification, has been adopted in the British Pharmacopœia. Blaud's pill is prepared by triturating exsiccated ferrous sulphate in a mortar with syrup, glycerin, and distilled water, and adding exsiccated sodium carbonate, the whole being set aside, and then massed with the aid of gum acacia and tragacanth. The ferrous sulphate reacts with the sodium carbonate, forming ferrous carbonate and sodium sulphate. When freshly prepared, each 5-grain pill will contain about 1 grain of ferrous carbonate. (Blaud's pills, if suitably coated, will retain their strength for an indefinite period of time; but uncoated pills quickly oxidise.) Dose, 5 to 15 grains.

Chromic Anhydride (CrO_3), commonly called chromic acid, is antiseptic, disinfectant, and caustic.

The preparation is the *Solution*, which contains the equivalent of 25 per cent. of the anhydride.

Cerium Oxalate.—Obtained by the interaction of a soluble cerium salt and a soluble oxalate.

A gastric sedative. Dose, 2 to 10 grains.

CHAPTER XIII.

Metals and Salts (*continued*).

Arsenium is found in certain ores, and by roasting these is obtained:

Arsenious Anhydride (Syn.: Arsenious Oxide, Arsenious Acid, Arsenic, White Arsenic).—An alterative and tonic. Dose, $\frac{1}{60}$ to $\frac{1}{15}$ grain. Only slightly soluble in water.

From this are prepared:

1. *Arsenical Solution, Fowler's Solution.* Prepared by heating a mixture of arsenic and potassium carbonate with water, and colouring the product, which is a solution of potassium arsenite, with compound tincture of lavender. Strength, 1 per cent.; dose, 2 to 8 minims.

2. *Hydrochloric Solution of Arsenic.* A solution of arsenic in dilute hydrochloric acid. Strength, 1 per cent.; dose, 2 to 8 minims.

Arsenious Iodide.—May be made by direct combination of iodine and arsenium. Dose, $\frac{1}{20}$ to $\frac{1}{5}$ grain.

The preparation is *Solution of Arsenious and Mercuric Iodides* (*Donovan's Solution*)—strength, 1 per cent. of each salt; dose, 5 to 20 minims.

Antimony occurs naturally as sulphide.

Purified Black Antimony of the Pharmacopœia is the native antimonious sulphide, purified by fusion and digestion with solution of ammonia. It is used for making **Sulphurated Antimony,** which is a mixture of sulphides and oxides of antimony with some free sulphur. Insoluble in water.

Medicinally, it is alterative. Dose, 1 to 2 grains.

It is used in the proportion of 1 part in 5 in making *Compound Calomel Pill.*

Antimonious Oxide.—Insoluble in water.

Medicinally, it acts as a diaphoretic, expectorant, and emetic. Dose, 1 to 2 grains.

The preparation is the *Antimonial Powder* (*James's Powder*)—strength, 1 in 3; dose, 3 to 6 grains.

Tartarated Antimony, Potassio-tartrate of Antimony, Tartar Emetic.—This has similar medicinal properties to the oxide, but, being more soluble, is more active. Dose: as a diaphoretic, $\frac{1}{24}$ to $\frac{1}{8}$ grain; as an emetic, 1 to 2 grains.

From it is prepared *Antimonial Wine*, which is made with sherry. Strength, 40 grains in a pint. Dose: as an expectorant, 10 to 30 minims; as an emetic, 2 to 4 fluid drachms.

Copper Sulphate (*Blue Vitriol*).—Dose: as an astringent, $\frac{1}{4}$ to 2 grains; as an emetic, 5 to 10 grains.

Mercury. — Obtained from the native sulphide. Mercury increases the secretions, particularly that of the salivary glands, and has alterative, cholagogue, purgative, and diuretic properties.

The preparations are:

1. *Mercury with Chalk, Grey Powder.* The metal is triturated with prepared chalk until globules are no longer visible to the naked eye. The product contains small quantities of the oxides of mercury. Strength, 1 in 3; dose, 1 to 5 grains.

2. *Mercury Pill, Blue Pill.* The metal is triturated with confection of roses and powdered liquorice ro ot Strength, 1 in 3 ; dose 4 to 8 grains.

3. *Mercurial Plaster.* The metal is triturated with a mixture of sulphur and olive oil, and the product mixed with about twice its weight of lead plaster. Strength, 1 in 3.

4. *Ammoniacum and Mercury Plaster.* The metal is treated as in making mercury plaster, and the product mixed with purified ammoniacum. Strength, 1 in 5.

5. *Mercury Ointment.* The metal is triturated with lard and a little suet. Strength, 1 in 2.

From this last are made :

(*a*) *Compound Mercury Ointment.* The simple ointment is mixed with beeswax, olive oil, and camphor. Strength of mercury, 1 in 5.

(*b*) *Liniment of Mercury.* Contains mercury ointment, strong solution of ammonia, and liniment of camphor. Strength of mercury, 1 in 6.

The metal is also used in making *Mercuric Nitrate Ointment.* Made by dissolving the metal in nitric acid, and mixing the product with a heated mixture of lard and olive oil. *Diluted Mercuric Nitrate Ointment* is made by mixing the strong ointment with four times its weight of soft paraffin. *Acid Solution of Mercuric Nitrate.* Made by dissolving the metal in nitric acid diluted with water.

Ammoniated Mercury (Syn. : Ammonio-Chloride of Mercury, Mercuric Ammonium Chloride, White Precipitate).—Made by adding solution of mercuric chloride to excess of solution of ammonia. Used as an insecticide.

The preparation is the *Ammoniated Mercury Ointment* —strength, 10 per cent.

Yellow Mercuric Oxide (HgO).—Obtained by the interaction of mercuric chloride and sodium hydroxide.

The preparation is the *Yellow Mercuric Oxide Ointment*—strength, 2 per cent.

Red Mercuric Oxide (HgO).—This oxide has the same chemical composition as the yellow oxide, but differs from it in appearance, not being so finely divided. It is prepared by heating mercurous nitrate until nitrous fumes cease to be evolved.

The preparation is *Red Mercuric Oxide Ointment* (*Red Precipitate Ointment*)—strength, 10 per cent.

Mercurous Chloride, Subchloride of Mercury, Calomel (Hg_2Cl_2).—Prepared by sublimation from a mixture of mercurous sulphate and sodium chloride. A heavy powder insoluble in water.

It is alterative and purgative. Dose, ½ to 5 grains.

The preparations are:

1. *Black Mercurial Lotion.*—The black oxide of mercury (Hg_2O) is precipitated by the interaction of mercurous chloride and solution of calcium hydroxide, and suspended with glycerin and mucilage of tragacanth.

2. *Compound Calomel Pill, Plummer's Pill*—strength, 1 in 5; contains also sulphurated antimony and guaiacum resin; dose, 4 to 8 grains.

3. *Calomel Ointment*—strength, 10 per cent.

Mercuric Chloride, Perchloride of Mercury, Corrosive Sublimate.—Prepared by sublimation from a mixture of mercuric sulphate, sodium chloride, and oxide of manganese. Crystalline. Soluble in water.

It is antiseptic and alterative and an irritant poison. Dose, $\frac{1}{32}$ to $\frac{1}{16}$ grain.

The preparations are:

1. *Yellow Mercurial Lotion.*—The yellow oxide of mercury (HgO) is precipitated by the interaction of mercuric chloride and solution of calcium hydroxide.

2. *Solution of Mercuric Chloride*—strength, about 1 in 875; dose, ½ to 1 fluid drachm.

Mercuric Iodide, Red Iodide of Mercury.—Prepared by the interaction of mercuric chloride and potassium iodide.

It is an alterative. Dose, $\frac{1}{32}$ to $\frac{1}{16}$ grain.

The preparations are:

1. *Donovan's Solution* (see p. 143).
2. *Mercuric Iodide Ointment*—strength, 4 per cent.

Mercuric Oleate.—An unctuous substance, prepared by the interaction of mercuric chloride and sodium oleate. It contains about 90 per cent. mercuric oleate $Hg(C_{18}H_{33}O_2)_2H_2O$.

The preparation is *Mercuric Oleate Ointment*—strength, 25 per cent.

Lead Acetate, Sugar of Lead.—Obtained by dissolving lead oxide or carbonate in acetic acid.

Sedative and astringent. Dose, 1 to 5 grains.

The preparations are:

1. *Pill of Lead with Opium.* Contains 75 per cent. lead acetate. Dose, 2 to 4 grains.

2. *Compound Lead Suppositories.* Each suppository contains 3 grains of lead acetate.

3. *Lead Acetate Ointment*—4 per cent.

Lead acetate is also used in making:

4. The *Strong Solution of Lead Subacetate, Goulard's Extract*, which is prepared by boiling lead acetate with lead oxide in water. From the strong solution is made *Diluted Solution of Lead Subacetate, Goulard's Water.*

5. *Glycerin of Lead Subacetate*, which is prepared by boiling a mixture of lead acetate, lead oxide, glycerin, and water. From this is prepared *Lead Subacetate Ointment.*

Lead Carbonate, the Hydroxycarbonate.—Used externally as an astringent.

The preparation is *Lead Carbonate Ointment*—strength, 10 per cent.

Lead Iodide is obtained by the interaction of lead nitrate or acetate and potassium iodide. It is a resolvent.

The preparations are *Lead Iodide Plaster* and *Lead Iodide Ointment.*

Lead Oxide, Litharge (PbO).—Prepared by the action of air on melted lead.

The preparation is *Lead Plaster.* The oxide is boiled with olive oil and water for some hours. The product is an oleate of lead with some glycerin mechanically mixed with it.

Bismuth.—Bismuth occurs in conjunction with quartz in the metallic state. In medicine the following salts are used:

1. The **Oxide** (Bi_2O_3), which is prepared by boiling the oxynitrate with solution of sodium hydroxide. It is a slightly brownish-yellow, heavy powder, insoluble in water.

Medicinally, it is antacid, and is useful for gastric affections, acting as a sedative. In mixtures it must be suspended, preferably by the use of compound powder of tragacanth. Dose, 5 to 20 grains.

2. **Carbonate of Bismuth.**—This is really an oxycarbonate. It is prepared by the interaction of normal bismuth nitrate and the official ammonium carbonate. It is a whitish, heavy powder, insoluble in water. Medicinally, its properties are similar to those of the oxide and its dose is the same.

The preparation is the *Compound Bismuth Lozenge.* Each lozenge contains 2 grains of oxycarbonate.

3. **Bismuth Subnitrate, or Oxynitrate,** is prepared by the interaction of the normal nitrate and water.

Its medicinal properties are similar to those of the oxide and carbonate, and its dose is the same. When mixed with water it slowly parts with nitric acid. The mixture is therefore always acid, and cannot be safely prescribed with a carbonate.

The preparation is the *Solution of Bismuth and Ammonium Citrate*, generally known as *Solution of Bismuth.* Prepared by freshly precipitating bismuth citrate by the interaction of the oxynitrate and potassium citrate, and dissolving the precipitate in solution of ammonia. Each fluid drachm of the finished preparation contains the equivalent of 3 grains of oxide of bismuth. Dose, ½ to 1 fluid drachm, diluted.

4. **Bismuth Salicylate.**—The oxysalt prepared by the interaction of bismuth nitrate and sodium salicylate. A white or nearly white powder, insoluble in water, by which, however, it is dissociated, salicylic acid being liberated. Dose, 5 to 20 grains.

Bismuth salts are often contaminated with arsenium and antimony, also with selenium and tellurium. The latter metal has the peculiar property of giving an onion-like smell to the breath. It is important that only pure salts be used in medicine.

Silver Nitrate is prepared by the interaction of nitric acid and the metal.

It is an astringent and sedative. Dose, ¼ to ½ grain. Used externally as a caustic.

The preparations are :

1. *Toughened Caustic.* Silver nitrate with 5 per cent. potassium nitrate.

2. *Mitigated Caustic.* Silver nitrate with twice its weight of potassium nitrate.

Silver Oxide is prepared by mixing solution of silver nitrate and calcium hydroxide.

It has similar medicinal properties to those of the nitrate, but is more slowly absorbed and is not caustic. Dose, ½ to 2 grains.

CHAPTER XIV.

Non-Metals, Acids, Organic Compounds, etc.

Iodine occurs in sea-water and seaweeds. It is a powerful antiseptic and absorbent. It is used externally as a counter-irritant. It is only slightly soluble in water, but is very soluble in solution of potassium iodide.

The preparations are:

1. *Tincture*—strength, 1 in 40; dose, 2 to 5 minims.
2. *Strong Solution* (*Liniment*)—strength, about 1 in 10.
3. *Ointment*—strength, 4 per cent.

Each of these preparations contains iodide of potassium.

Phosphorus.—Obtained from calcium phosphate. A valuable tonic in minute doses. An irritant poison in large doses. Dose, $\frac{1}{100}$ to $\frac{1}{20}$ grain.

The preparations are:

1. *Phosphorated Oil*—1 per cent.; dose, 1 to 5 minims.
2. *Phosphorus Pill*—2 per cent.; dose, 1 to 2 grains.

Sulphur.—Two varieties are official:

1. **Precipitated Sulphur (Syn.: Milk of Sulphur).**—Insoluble in water. Slightly purgative. Useful in chronic rheumatism. Dose, 20 to 60 grains.

The preparation is *Sulphur Lozenge*, which contains 5 grains of precipitated sulphur.

2. **Sublimed Sulphur (Syn.: Flowers or Flour of Sulphur).**—Properties and dose as precipitated sulphur.

The preparations are the *Confection of Sulphur* and

Sulphur Ointment. It is also used in making *Compound Liquorice Powder* (see p. 14).

3. **Sulphur Iodide.**—An unstable compound prepared by the direct union of the two elements by means of heat. Used for making *Sulphur Iodide Ointment,* which is a useful application for the destruction of parasites.

Acetic Acid is obtained by the destructive distillation of wood, and by the acetic fermentation of ethylic alcohol. There are three official strengths: (1) Glacial acetic acid, 99 per cent.; (2) acetic acid, 33 per cent.; (3) dilute acetic acid, 4·27 per cent. Dose of the dilute acid, $\frac{1}{2}$ to 2 fluid drachms.

Medicinally, acetic acid is refrigerant, sialogogue, and antiseptic. It is also used as a solvent, particularly in preparing the official vinegars. (See pp. 36, 118.)

Diluted Hydrobromic Acid.—Prepared by distilling potassium bromide with concentrated phosphoric acid. Contains 10 per cent. of hydrobromic acid.

A sedative and hypnotic. Dose, 15 to 60 minims. It causes less depression than the bromides of potassium, sodium, and ammonium, but is not so trustworthy.

Hydrochloric Acid.—A solution of hydrochloric acid gas of the strength 31·79 per cent. It is a caustic.

Diluted Hydrochloric Acid.—Strength, 10·58 per cent. of hydrochloric acid gas. A stimulant, sialogogue, and cholagogue. Dose, 5 to 20 minims.

Diluted Hydrocyanic Acid.—A 2 per cent. solution of hydrocyanic (prussic) acid. Prepared by the interaction of diluted sulphuric acid and potassium ferrocyanide. It is a sedative. Dose, 2 to 6 minims, well diluted.

This acid must be carefully distinguished from Scheele's prussic acid, the strength of which is about 4 per cent., and which is chiefly used for destroying domestic animals, whose lives have become a burden to themselves or their owners.

The preparation is the *Compound Tincture of Chloroform and Morphine.* It contains 5 per cent. of *Diluted Prussic Acid.*

Nitric Acid.—Contains 70 per cent. true nitric acid. Strongly corrosive; used to burn warts, etc.

Diluted Nitric Acid.—Contains 17·44 per cent. true nitric acid. It is a refrigerant and tonic. Dose, 5 to 20 minims.

Diluted Nitro-Hydrochloric Acid.—Prepared by mixing nitric acid, hydrochloric acid, and water, and setting the mixture aside for a fortnight. Contains free chlorine, hydrochloric, nitric, and nitrous acids in water. It is a gastric tonic. Dose, 5 to 20 minims.

Sulphuric Acid.—Contains 98 per cent. true sulphuric acid. It is a powerful caustic.

Diluted Sulphuric Acid.—Contains 13·65 per cent. true sulphuric acid. A tonic and refrigerant. It excites appetite and promotes digestion. Dose, 5 to 20 minims.

It is used in making *Acid Infusion of Roses.*

Aromatic Sulphuric Acid (Syn.: Elixir of Vitriol).—Contains 13·8 per cent. true sulphuric acid. Dose, 5 to 20 minims.

It is used in making *Acid Infusion of Cinchona.*

Sulphurous Acid.—A solution containing 6·4 per cent. true sulphurous acid (H_2SO_3), equals 5 per cent. sulphurous anhydride (SO_2).

It is disinfectant and antiseptic. Dose, ½ to 1 fluid drachm.

Concentrated Phosphoric Acid.—A syrupy liquid, containing 66·3 per cent. orthophosphoric acid.

Used in making *Syrup of Lactophosphate of Calcium* and *Syrup of Ferrous Phosphate.*

Diluted Phosphoric Acid.—Contains 13·8 per cent.

orthophosphoric acid. It is tonic and refrigerant. Dose 5 to 20 minims.

Boric or Boracic Acid.—A weak acid occurring in small colourless crystals. Antiseptic. Dose, 5 to 15 grains.

The preparations are *Glycerin of Boric Acid*, 30 per cent., and *Boric Acid Ointment*, 10 per cent.

Citric Acid. — A vegetable acid obtained from the lemon fruit. Should be quite free from lead, with which poisonous metal it sometimes becomes contaminated in the process of manufacture.

A refrigerant. Dose, 5 to 20 grains.

Twenty parts of citric acid neutralise 28·5 parts of bicarbonate of potassium and 24 parts of bicarbonate of sodium.

Tartaric Acid.—Prepared from cream of tartar (see p. 124). Medicinal properties and dose as citric acid.

Twenty parts tartaric acid neutralise 26·75 parts bicarbonate of potassium and 22·5 parts bicarbonate of sodium.

Tannic Acid (Syn.: Tannin, Gallotannic Acid).—Obtained from galls.

Astringent. A valuable antidote to poisonous alkaloids, as it forms nearly insoluble tannates. Dose, 2 to 5 grains.

The preparations are :

1. *Glycerin of Tannic Acid*—1 in 5.
2. *Tannic Acid Suppositories.* Each suppository contains 3 grains of tannic acid.
3. *Tannic Acid Lozenges.* Each lozenge contains ½ grain of tannic acid.

Gallic Acid.—Obtained by acting on tannic acid with sulphuric acid.

Has similar properties to those of tannic acid, but is inferior as a local astringent. Dose, 5 to 15 grains.

Benzoic Acid.—Prepared either from gum benzoin (see p. 103) or artificially from various organic compounds.

Antiseptic and diuretic. Dose, 5 to 15 grains.

From it are prepared *Benzoic Acid Lozenges.* Each lozenge contains $\frac{1}{2}$ grain of the acid. It is contained also in *Compound Tincture of Camphor* and *Ammoniated Tincture of Opium.*

Salicylic Acid. —Obtained from natural salicylates, such as the oils of winter-green and sweet birch, or made artificially. Chemically, it is allied to benzoic acid.

Antiseptic and antipyretic. Dose, 5 to 20 grains. Much used in acute rheumatism.

The preparation is *Salicylic Acid Ointment*—2 per cent. It is used also to preserve solution of sulphate of atropine.

Lactic Acid.—A syrupy liquid containing 75 per cent. of true lactic acid, formed by the fermentation of milk sugar. The strong acid is used for removing diseased tissues. The freely diluted acid is used in dyspepsia.

Ether.—A volatile liquid prepared from ethylic alcohol by means of sulphuric acid (hence sometimes called sulphuric ether). It contains at least 92 per cent. by volume of ethyl oxide, $(C_2H_5)_2O$. (Ethylic alcohol is ethyl hydroxide, C_2H_5HO.)

Ether is used internally as a stimulant and antispasmodic. Dose, 10 to 30 minims for repeated administration, 40 to 60 minims for a single dose. Also as a local anæsthetic and a general anæsthetic. It is a solvent of oils and most vegetable alkaloids, and hence is used in making liquid extract of male fern (see p. 30).

The preparations are:

1. *Spirit of Ether*—Strength, 1 in 3 (alcohol 90 per

cent.), which is used in the preparation of ethereal tincture of lobelia. Dose for repeated administration, 20 to 40 minims; for a single dose, 60 to 90 minims.

2. *Compound Spirit of Ether* (Syn.: *Hoffman's Anodyne*). Contains ether, ethyl sulphate, etc. Dose as spirit of ether.

3. *Collodion.* (See page 95.)

Purified Ether.—Ether from which most of the ethylic alcohol has been removed by washing, and most of the water by distillation with desiccating agents.

Used as an anæsthetic, and in the preparation of *Extract of Strophanthus* (see p. 93).

Acetic Ether consists chiefly of ethyl acetate. It resembles ether in its medicinal action, but is milder. Dose, 20 to 40 minims for repeated administration, 60 to 90 minims for a single dose.

Used also for making *Blistering Liquid.*

Spirit of Nitrous Ether (sweet spirit of nitre). An alcoholic solution containing at least 1·75 per cent. ethyl nitrite, with aldehyde, etc. Dose for repeated administration, 20 to 40 minims; for a single dose, 60 to 90 minims.

Solution of Nitrous Ether.—Contains at least 2½ per cent. ethyl nitrite. Dose, 20 to 60 minims.

Glycerin, or **Glycerol (Glyceryl Hydroxide),** is obtained by the interaction of alkalies with fats and fixed oils.

It is a useful antiseptic and solvent. Externally, it is an emollient; given internally in large doses it is a laxative. Dose, 1 to 2 fluid drachms.

From it are prepared *Glycerin Suppositories.* Each suppository contains 70 per cent. of its weight of glycerin.

The class of preparations known as glycerins have been mentioned under the various drugs which enter into their composition.

Nitroglycerin (Glyceryl Trinitrate, Trinitrin) is not official, but the following preparations are :

1. *Solution of Trinitrin*—strength, 1 per cent. ; dose, $\frac{1}{2}$ to 2 minims.

2. *Trinitrin Tablets*—five-grain chocolate tablets, each of which contains $\frac{1}{100}$ grain of trinitrin. Dose, 1 or 2 tablets.

Medicinally, these preparations are antispasmodic, dilating the arteries and hence diminishing blood pressure.

Phenol, Carbolic Acid.—Its chemical composition is that of an alcohol, but it forms salts as do acids. It is obtained from coal-tar, which is a by-product in the manufacture of illuminating gas—hence its name (Greek, φαίνω, *phainō*, I light).

It is a powerful antiseptic. Dose, 1 to 3 grains.

The preparations are :

1. *Liquefied Phenol.* Contains 90·9 per cent. phenol. Dose, 1 to 3 minims.

2. *Glycerin of Phenol*—strength, 1 in 5.

3. *Phenol Suppositories*—each suppository contains 1 grain of phenol.

4. *Phenol Lozenges*—each lozenge contains 1 grain of phenol.

5. *Phenol Ointment*—strength, 1 in 25.

Creosote (Greek, κρέας, *kreas*, flesh ; and σωτήρ, *soter*, a preserver, so-called, because it preserves animal substances).—A mixture of guaiacol, creosol, and other phenols, obtained in the distillation of wood-tar.

Disinfectant and antiseptic. Dose, 1 to 5 minims.

The preparations are *Creosote Mixture* (each fluid ounce contains 1 minim of creosote. Dose, $\frac{1}{2}$ to 1 fluid ounce), and *Creosote Ointment*, strength, 1 in 10.

Chloroform, Trichloromethane ($CHCl_3$). — The official chloroform contains some alcohol to preserve it.

Chloroform is a general anæsthetic. It is used internally to relieve vomiting. Dose, 1 to 5 minims.

The preparations are:

1. *Chloroform Water*—1 in 400.
2. *Chloroform Liniment*—1 in 2.
3. *Spirit of Chloroform*—1 in 20. Dose, 5 to 20 minims for repeated administration, 30 to 40 minims for a single dose.
4. *Compound Tincture of Chloroform and Morphine*—10 minims of the tincture contains $\frac{3}{4}$ minim of chloroform. Dose, 5 to 15 minims.

Iodoform, Triodomethane (CHI_3).— Small yellow crystals having a disagreeable odour.

Antiseptic and alterative. Dose, $\frac{1}{2}$ to 3 grains.

The preparations are:

1. *Iodoform Suppositories*—3 grains in each.
2. *Iodoform Ointment*—10 per cent.

Carbon Bisulphide.—Used as a solvent in the preparation of *Indiarubber Solution* and *Phosphorus Pills.*

Chloral Hydrate.—A hypnotic. Dose, 5 to 20 grains. Very soluble in water.

The preparation is the *Syrup of Chloral*—1 in 6.

Butyl Chloral Hydrate. — Formerly called croton chloral hydrate. A hypnotic. Dose, 5 to 20 grains.

Naphthol, Beta-naphthol.—Disinfectant and antiseptic. Dose, 3 to 10 grains.

Benzol.—A solvent used in the preparation of *Mustard Paper* and *Indiarubber Solution.*

Paraldehyde.—A colourless liquid with an ethereal smell and acrid taste.

A hypnotic. Dose, $\frac{1}{2}$ to 2 fluid drachms.

Terebene.—A mixture of hydrocarbons, obtained by the action of sulphuric acid on turpentine.

Antiseptic and disinfectant. Inhaled by phthisical patients. Dose, 5 to 15 minims.

Salol, Phenyl Salicylate. — Almost insoluble in water, soluble in rectified spirit.

Antipyretic and antiseptic. Dose, 5 to 15 grains.

Amyl Nitrite. —Obtained from amylic alcohol.

Antispasmodic. When inhaled it has a rapid effect, dilating the arteries, and hence diminishing blood pressure. Dose, by inhalation of the vapour, 2 to 5 minims.

Gluside, commonly known as **Saccharin.**—A crystalline powder having an intensely sweet taste. Used as a substitute for sugar, which it only resembles in taste.

Phenacetin.—Dose, 5 to 10 grains.

Acetanilide, commonly known as **Antifebrin.**— Dose, 1 to 3 grains.

Phenazone, commonly known as **Antipyrin.**—Dose, 5 to 20 grains.

These preparations are allied chemically, and have similar medicinal properties, being analgesic and antipyretic.

Sulphonal.—A hypnotic. Dose, 10 to 30 grains.

Paraffins are saturated and chemically indifferent compounds (*parum*, little; *affinis*, affinity).

Hard Paraffin.—A mixture of several of the harder members of the paraffin series. Melting-point, 54·4° to 57·2° C.

It is used in making ointments.

Soft Paraffin.—Contains soft members of the paraffin series. Melting-point, 35·5° to 38·9° C. White or yellow.

It is used in making ointments.

Liquid Paraffin (Syn.: White Petroleum Oil).—A mixture of the higher fluid members of the paraffin series. Obtained from petroleum after the more volatile portions have been distilled. Boiling-point not below 360° C.

It is used as an application in chronic eczema, and is administered with hypophosphites in the form of an emulsion.

Prepared Coal-Tar.—Coal-tar contains phenol and cresol. It is used for making *Solution of Coal-Tar*, which consists of coal-tar mixed with a tincture of quillaia bark in order that the product may emulsify with water.

Used for skin diseases.

Hydrogen Peroxide (H_2O_2).—The product of the action of a dilute acid on barium peroxide. It is not official, but a dilute solution, which yields ten times its volume of oxygen when treated with sulphuric acid and permanganate of potassium, is included in the Pharmacopœia.

Medicinally, the solution is antiseptic and alterative; and it is also used externally as a disinfectant in surgical dressings, etc. Dose, $\frac{1}{2}$ to 2 fluid drachms, well diluted.

APPENDIX.

WEIGHTS AND MEASURES.

In the British Pharmacopœia both the English (avoirdupois) and Metric systems of weights and measures are recognised.

The English System of Weights and Measures.

WEIGHTS.

Pound (*lb.*).		*Ounces* (*oz.*).		*Grains* (*grs.*).
1	=	16	=	7,000
		1	=	437·5

The avoirdupois drachm equals one-sixteenth of an ounce. It is seldom used.

MEASURES OF LENGTH.

Yard.		*Feet.*		*Inches.*
1	=	3	=	36
		1	=	12

MEASURES OF CAPACITY.

Gallon (*gall.*).		*Quart* (*qt.*).		*Pint* (*pt.*).		*Fluid Ounces* (*fl. oz.*).		*Fluid Drachms* (*fl. drs.*).		*Minims.* (*m.*).
1	=	4	=	8	=	160	=	1,280	=	76,800
				1	=	20	=	160	=	9,600
						1	=	8	=	480
								1	=	60

One gallon of distilled water at 16·7° C. (62° F.) weighs 10 pounds.

Note.—Commercially, a "Winchester quart" measures about ½ gallon.

The Metric System of Weights and Measures.

WEIGHTS.

The standard of weight is the gramme.

1 milligramme = 0·001 gramme
1 centigramme = 0·01 gramme
1 decigramme = 0·1 gramme

MEASURES OF LENGTH.

The standard of length is the metre.

1 millimetre = 0·001 metre
1 centimetre = 0·01 metre
1 decimetre = 0·1 metre

MEASURES OF CAPACITY.

The standard measure of capacity is the litre = 1,000 cubic centimetres.

1 millilitre = 1 cubic centimetre
1 centilitre = 10 cubic centimetres
1 decilitre = 100 ,, ,,
1 litre = 1,000 ,, ,,

One c.c. of distilled water at 4° C. (39° F.) weighs 1 gramme.

The English and Metric System of Weights and Measures Compared.

WEIGHTS.

English.		*Metric.*
1 grain	equals about	0·065 gramme
1 ounce	,, ,,	28·35 grammes
1 pound	,, ,,	453·6 grammes

MEASURES OF LENGTH.

English.		*Metric.*
1 inch	equals about	2·5 centimetres
1 foot	,, ,,	30 centimetres
1 yard	,, ,,	90 centimetres

MEASURES OF CAPACITY.

English.		*Metric.*
1 minim	equals about	0·059 c.c.
1 fluid drachm	,, ,,	3·55 c.c.
1 fluid ounce	,, ,,	28·4 c.c.
1 pint	,, ,,	568 c.c.
1 gallon	,, ,,	4,546 c.c., or 4·546 litre

The Metric and English System of Weights and Measures Compared.

WEIGHTS.

Metric.		*English.*
1 milligramme	equals about	0·015 grain
1 centigramme	,, ,,	0·15 grain
1 decigramme	,, ,,	1·54 grains
1 gramme	,, ,,	15·43 grains

MEASURES OF LENGTH.

Metric.		*English.*
1 millimetre	equals about	0·04 inch
1 centimetre	,, ,,	0·4 inch
1 decimetre	,, ,,	4 inches
1 metre	,, ,,	39 inches (3¼ feet)

MEASURES OF CAPACITY.

Metric.		*English.*
1 c.c.	equals about	17 minims
10 c.c.	,, ,,	169 minims, or 2 fluid drachms, 49 minims
100 c.c.	,, ,,	1,690 minims, or 3 fluid ounces, 4 fluid drachms, 10 minims, or 3½ fluid ounces approximately.
1,000 c.c.	,, ,,	16,900 minims, or 1 pint, 15 fluid ounces, 1 fluid drachm, 40 minims, or 1¾ pints approximately.

In dispensing prescriptions the apothecaries or Troy weights and measures are used.

The following are the weights and measures with the symbols used for them.

For Solids.

℥i = 1 ounce = 480 grains
ʒi = 1 drachm = 60 grains
℈i = 1 scruple = 20 grains

For Liquids.

℥i = 1 fluid ounce = 480 minims
ʒi = 1 fluid drachm = 60 minims

NOTE.—1 oz. = 1 avoirdupois ounce = 437·5 grains
℥i = 1 Troy ounce = 480 grains
1 lb. = 16 avoirdupois ounces = 7,000 grains
1 lb. = 12 Troy ,, = 5,760 ,,

THE ALCOHOLIC SOLUTIONS OF THE BRITISH PHARMACOPŒIA, 1898, USED AS MENSTRUA AND SOLVENTS.

NOTE.—By alcohol is meant ethylic alcohol (ethyl hydroxide) which is produced by the fermentation of sugar.

Name.	Specific Gravity.	Per Cent. by Volume.	Per Cent. by Weight.	Excise Strength.
Alcohol absolutum	0·7969 to 0·794	99·4 to 99·95	At least 99 per cent.	74·25 O.P. to 75·21 O.P.
Alcohol 90 per cent. (Syn. : rectified spirit)	0·834	90	85·7	57·8 O.P.
Alcohol 70 per cent.	0·890	70	62·4	22·78 O.P.
Alcohol 60 per cent.	0·9135	60	52·0	5·18 O.P.
Alcohol 45 per cent.	0·9436	45	38·0	21·07 U.P.
Alcohol 20 per cent.	0·976	20	16·3	64·94 U.P.

The solutions of lower alcoholic strengths can be prepared from the 90 per cent. volume solution as follows :

Volumes.	Volumes.	Approximate Product at 60° F. (15·5° C.).
To 1 gallon of 90 per cent. add	50 fluid ounces water	1 gallon 45 fluid ounces of 70 per cent.
To 1 gallon of 90 per cent. add	85¾ fluid ounces water	1½ gallons of 60 per cent.
To 1 gallon of 90 per cent. add	168½ fluid ounces water	2 gallons of 45 per cent.
To 1 gallon of 90 per cent. add	3½ gallons 10 fluid ounces water	4½ gallons of 20 per cent.

The solutions of lower alcoholic strength can be prepared from 90 per cent. volume solutions as follows:

Volumes.	Volumes.	Approximate Product at 60° F. (15·5° C.).
To 1 litre (1,000 c.c.) of 90 per cent. add	310 c.c water	1·284 litres of 70 per cent
To 1 litre (1,000 c.c.) of 90 per cent. add	536 c.c. water	1·500 litres of 60 per cent.
To 1 litre (1,000 c.c.) of 90 per cent. add	1,053 c.c. water	2·000 litres of 45 per cent.
To 1 litre (1,000 c.c.) of 90 per cent. add	3,547·5 c.c. water	4·500 litres of 20 per cent.

To convert percentage by volume of alcohol into percentage by weight, multiply the percentage by volume of alcohol by 0·7938, and divide the product by the specific gravity of the liquid. Thus, alcohol containing 90 per cent. by volume contains $90 \times \frac{0{\cdot}7938}{0{\cdot}834} = 85{\cdot}7$ per cent. by weight.*

By reversing the process, the percentage of alcohol by weight may be converted into percentage by volume.

To express percentage by volume of alcohol in proof strength, multiply the percentage by volume of alcohol by 1·753, and deduct 100 from the product. Plus quantities are above proof, minus quantities are under proof. Thus, alcohol 60 per cent. by volume equals $(60 \times 1{\cdot}753) - 100 = 5{\cdot}18$, or approximately 5·2 per cent. over proof. And alcohol 20 per cent. by volume equals $(20 \times 1{\cdot}753) - 100 = -64{\cdot}94$, or approximately 65 per cent. under proof.*

Other alcoholic liquors used in the Pharmacopœia are:

(1) *Orange Wine* (see p. 76).

(2) *Sherry Wine*, which must contain at least 16 per cent. by volume of ethylic alcohol, and must be free from salicylic acid.

Preparations.—Antimonial wine, Colchicum wine, Ipecacuanha wine, and Iron wine

(3) *Brandy* (Spiritus Vini Gallici, P.B.), which must contain at least 43·5 per cent. by volume of ethylic alcohol, and is used for making *Brandy Mixture*, which contains yolk of egg, sugar, and cinnamon water in addition to the spirit.

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* These paragraphs are taken from Wellcome's Chemist's Diary for 1899 by kind permission of the publishers.

The following preparations are made with :

90 *per Cent.* *Alcohol.*	70 *per Cent.* *Alcohol.*	60 *per Cent.* *Alcohol.*	45 *per Cent.* *Alcohol.*	20 *per Cent.* *Alcohol.*
Acet. ipecac.				
Acid. sulphuric. aromat.				
Aqua camphoræ				
Collodium				
Ext. belladon. liq.				
Ext. cannab. ind.				
Ext. cascar. sagrad. liq.				
Ext. cimicifugæ liq.		Ext. cocæ liq.		
Ext. cinchon. liq.		Ext. colocynth co.		
Ext. ergotæ liq.		Ext. ergotæ	Ext. euonymin sicc.	
Ext. glycyrrh. liq.			Ext. hamamelidis liq.	
Ext. ipecac. liq.			Ext. hydrastis liq.	
Ext. jalapæ			Ext. jaborandi	
Ext. nucis vom. liq.	Ext. nucis vom. liq.			
Ext. opii liq.				
Ext. pareiræ liq.				
Ext. physostigmatis		Ext. rhei		
Ext. strophanthi	Ext. stramonii	Ext. taraxaci liq.	Ext. sarsæ liq.	
Fel. bovinum pur.				
Jalapæ resina				
All the liniments				
(Liq. ethyl nitritis with 99 per cent. alcohol)				

NOTE.—The above table does not indicate the alcoholic strength of the finished products.

90 *per Cent.* *Alcohol.*	70 *per Cent.* *Alcohol.*	60 *per Cent.* *Alcohol.*	45 *per Cent.* *Alcohol.*	20 *per Cent.* *Alcohol.*
Liq. calumb. conc.				Liq. chiratæ conc.
Liq. hamamelidis				Liq. cuspariæ conc.
Liq. iodi. fort.				Liq. krameriæ conc.
Liq. morph. acet.				
Liq. morph. hydrochlor.				Liq. pancreaticus
Liq. morph. tart.				Liq. quassiæ conc.
Liq. picis carb.				Liq. rhei conc.
Liq. plumbi subacet. dil.				
Liq. sarsæ co. conc.				Liq. senegæ conc.
Liq. sennæ conc.				
Liq. strych. hydrochlor.				Liq. serpentariæ conc.
Liq. trinitrini				
Mucilago tragacanth.				
Pil. hyd. subchlor. co.				
Podoph. resin.				
Scammon. resin.				
All the spirits				
Succus belladon.				
Succus conii				
Succus hyoscyami				
Succus scoparii				
Succus taraxaci				
Syr. cascar. arom.				
Syr. limonis				

NOTE.—The above table does not indicate the alcoholic strength of the finished products.

90 *per Cent.* Alcohol.	70 *per Cent.* Alcohol.	60 *per Cent.* Alcohol.	45 *per Cent.* Alcohol.	20 *per Cent.* Alcohol.
Syr. rhei				
Syr. rhœados				
Syr. sennæ				
Syr. zingiberis				
Tr. aurantii	Tr. aconiti	Tr. belladon.	Tr. aloes	
Tr. benz. co.	Tr. arnicæ	Tr. buchu		
Tr. cannab. indic.	Tr. asafetidæ	Tr. calumbæ		
Tr. cantharidis	Tr. capsici	Tr. camph. co.		
Tr. chlor. et morph. co.	Tr. cascarillæ	Tr. cardam. co.		
Tr. cubebæ	Tr. cinchonæ	Tr. catechu		
Tr. ferri perchlor.	Tr. cinchonæ co.	Tr. chiratæ	Tr. cocci	
Tr. guaiaci amm.	Tr. cinnamomi	Tr. cimicifugæ	Tr. colchici sem.	
Tr. iodi	Tr. conii	Tr. croci		
Tr. kino	Tr. jalapæ	Tr. digitalis		
Tr. lavand. co.		Tr. ergotæ ammon.	Tr. gentian co.	
Tr. limonis		Tr. gelsemii	Tr. hamamelidis	
Tr. myrrhæ		Tr. hydrastis	Tr. hyoscyami	
Tr. nucis vom.		Tr. krameriæ	Tr. jaborandi	
Tr. opii		Tr. lupuli		
Tr. opii ammon.	Tr. pyrethri	Tr. quillaiæ		
Tr. podophylli	Tr. serpentariæ	Tr. quin. ammon.	Tr. quassiæ	
Tr. pruni virg.	Tr. strophanthi	Tr. rhei co.		
Tr. tolutana	Tr. sumbul.	Tr. scillæ	Tr. sennæ co.	
Tr. zingiberis		Tr. senegæ	Tr. stramonii	
		Tr. valerian. ammon.		

NOTE.—The above table does not indicate the alcoholic strength of the finished products.

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